RAILROAD GAZETTE

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Contributions

Electric Headlights.

Chicago, Feb. 10, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with much interest your editorial on the "Westfield Collision." It seems to me very easy to solve the question of the best means to adopt for the prevention of just such accidents. Equip all locomotives with electric headlights and thousands of railroad accidents such as occur every year will surely be prevented.

R. C. VILAS.

Center Plates, Side Bearings and Flange Wear.

Adrian, Mich., Feb. 14, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the *Railroad Gazette* of February 6 is an article by H. M. Perry on Wheel Flange and Rail Wear. Sharp flanges on freight-car wheels have always been with us; but I infer from the article referred to that with the large capacity freight cars we are making more of them than formerly. If we inquire as to some of the causes tending to make sharp flanges on wheels we shall find that when the carrying capacity of freight cars was increased from 40,000 lbs. to 60,000, 80,000 and 100,000 lbs., mechanics seemed not inclined to trust cast-iron and so had center plates made of soft steel. Could any worse metal have been chosen for that particular purpose? With the great weight put upon the center plates the two surfaces hug like two magnets. Very little thought has been bestowed on these center plates. In the first place the bearing surface is not in proportion to the load carried, really less than in those formerly used under cars of 20,000 lbs. capacity. It is beginning to dawn on the minds of some that a portion of the load should be carried on the side bearings. I believe that side bearings can be constructed so as to relieve the center plates and not impede the curving. Side bearings having two rollers or wheels 5 in. in diameter, with 2½ in. face, cast in a chill should prove satisfactory. Each roller must be of two diameters, the outside 5 in., the inside 4½ in. They will then travel in a circle, and if the proper taper is obtained the two rollers at each end of the bolster will describe the circle perfectly. The gudgeons should be of 1 in. round bar steel. I think the reason why roller side-bearings have been discarded is that the periphery has been parallel; the tendency is then to roll in a straight line and soon become flat.

Sharp flanges are sometimes caused by one wheel on the same axle being somewhat softer than the other. The harder wheel will soon force the softer one to the flange. I would suggest to enlarge the center plates; to change the form and the material of which they are made; and to make the top center plate cover the bottom one so that it will keep out the dust. This will reverse the present positions. The frame for the roller side-bearing should be made on a curve. If the side-bearings are placed 2 ft. 6 in. from the center each way, or less, 5 ft. or less should be the diameter of the circle. The bearing for the gudgeons to revolve in should be smooth. Mr. Perry in his article cites a case of one car of large capacity having been in service 17 months, the load during all that time being carried largely on the roller side-bearings, and with good results.

JOHN KIRBY.

Mr. Baer Before the Strike Commission.

President Baer, of the Philadelphia & Reading, on Feb. 12 closed the argument for the coal operators, before the Anthracite Strike Commission. Extracts from his address follow:

The Right To Organize.

In general, no one denies the right of man to organize for any lawful purpose, but the right to organize and the power of the organization when organized must still be governed and controlled by the general law of the land, under which our individual and property rights are protected.

We constantly hear the cant phrase, "Capital organizes, why may not labor organize?" as if this settled the whole problem. But capital cannot organize for an illegal purpose. Organized capital is subject to sharper scrutiny than any other kind of organization. A possible violation of individual rights is at once seized upon by the public as immediately requiring some new and drastic law if existing laws are not adequate to meet public expectations.

For example: May capital organize in such a way that one manufacturer may employ pickets to surround the establishment of another competing manufacturer and prevent ingress and egress to the works, or interfere with the sale of its commodities by intercepting its customers, or interfere with the transportation of its products?

We concede to organized labor the same rights that we claim for organized capital. Each must keep within the law. There cannot be one law for citizens and corporations and another for labor organizations.

The lawlessness in the coal regions was the direct result of mistaken theories as to the rights of the mine workers. It will not do to say that the leaders have not encouraged violence and crime. It is true, no doubt, that they did not advise it. They may, at times, have counseled against it, and expressed regrets for it; nevertheless, they are legally and morally responsible for the situation they created, and from which this violence and crime necessarily resulted.

The leaders denounce the police employed solely for the purpose of defending life and property. They complain bitterly of the decisions of the legally constituted courts.

They denounce courts whereby riotous conduct, unlawful destruction of property and interference with legal rights of citizens are restrained. They even demand of their political supporters the passage of laws which will place trades unions above and beyond the law of the land.

They blindly refuse to see that the peace and prosperity of the community and the rights of the citizens can be maintained only through the supremacy of the law and its just and equal administration. The overthrow of the civil power whereby whole communities are at the mercy of the mob, so delights them that they cry out lustily against the soldiers who are sent to maintain order.

It is in evidence that they complain to the Governor that American citizens on their way to work were guarded by soldiers, and the Governor of this great Commonwealth, in tender regard for their feelings, orders the commanding general to report and practically apologize for guarding a workman from the fury of the miners' organization.

Now, with such official teachings, let us look at the natural result which must flow from them. Boys and foreigners, representing many different peoples and speaking divers tongues, constitute the majority of the organization which promulgates these doctrines. The boys, like most boys, have not been disciplined to reverence law and order. The foreigners, many of them, have been governed in their old homes by stringent police regulations. The law in the person of a policeman, or of a gendarme, confronted them everywhere. They come to this country with confused ideas of what free government means.

The distinction between liberty regulated by law and license is unknown; therefore, when a powerful organization, of which they are members, led by men who are upheld and encouraged in a respectable community, tells them that force may be used to compel men to join their union; that "scabs" should be ostracized; that they are given power to suspend operations at a colliery where the employees do not join the union, is it not a direct invitation—nay, more, a command—to them to commit the violence and crime that characterized the reign of terror in the mining region?

The men who teach these false doctrines are inciting riot. Every day they see the results of their work in outrage against persons and property. They make no reasonable effort to restrain the violence.

Strike of Pumpmen.

Take the famous pump order. The leaders intended to enforce their demands by the threatened destruction of the mines. They well know that if the pumping ceased the mines would be destroyed. They thought the operators would yield rather than see the ruin of the mines. The operators did not yield.

Every attempt to supply men to work the pumps was met by mobs, by pickets and all the devices that labor organizations commonly use to prevent men from working. The mines had to be guarded by armed police. The energy of the operators was taxed to its utmost to obtain workmen from all over the United States to prevent the destruction of the mines. Now they say, in excuse of this monstrous conduct, that they committed no wrong, because we could have saved our property by acceding to their demands for eight hours.

If a highwayman meets me on the road and demands my purse, and I refuse to give it to him and he shoot me down, he is not guilty of murder, because, forsooth, had I given him the purse he would have been content and gone on his way. No more wicked act was ever perpetrated by bold men than the issuing of the pump order.

Think what the result would have been had the efforts of the Mine Workers' Union to drown out all our collieries been successful! Words may obscure the evil of almost any plea, however tainted and corrupt, but the ingenuity of man cannot invent a plausible excuse for this order, other than the wantonness of power.

Herbert Spencer in his last book says: "Those who joining a trade union surrender their freedom to make engagements on their own terms and allow themselves to be told by their leaders when to work and when not to work, have no adequate sense of that fundamental right which every man possesses to make the best of himself, and to dispose of his abilities in any way he pleases."

What would Spencer have said of Mr. Mitchell's and Mr. Gompers' new limitation of human freedom? Here it is:

"A man who works during a strike has no moral right to work if his work destroys the hope and aspirations of his fellow man." You observe that they both evade the legal aspect. They do not undertake to say, under the present organization of society and under the Constitution and laws as they now exist, that a man has no legal right to work, but they set up an undefined law of their own, a higher law which is based upon that intangible thing called "moral right" in contra-distinction from a legal right.

If a mob in convention assembled declares that only the Protestant religion shall prevail in a community, am I to be debarred from the right of going to the Catholic Church because it would destroy the hope and aspirations of the Protestant clergy? Socialism as taught by some of its most brilliant exponents has never, in its wildest dreams, undertaken to reorganize society on such a basis.

Uniformity in Wages.

Many good men have found fault with us for not making an agreement with the United Mine Workers of America. It is only just to those men to say that most of them had no knowledge of the facts and have had no experience in business, and look at the subject from either a sentimental or theoretic standpoint.

You will recall that the demand was made upon us for a uniform scale of wages covering the whole anthracite field. All of the operators were asked to meet in convention with a view to adopting a uniform scale.

Now, herein lies one of the difficulties in dealing with subjects of this kind. I think many labor leaders may justly be criticized for striving too eagerly for uniformity in wages and conditions. Perhaps this is owing to the fact that the best types of labor organizations we have in this country have been in trades where the work has been single and not diverse.

But, when you come to take up the diversity of work in a great manufacturing industry, where the process begins with the raw material and proceeds to its ultimate manufacture into the most complicated machine, you see it is not single. It requires men of different skill; and the whole theory of uniformity becomes impracticable. In general, diversity, and not uniformity, is the universal law. Diversity is the complement of unity.

I have no doubt Mr. Mitchell's knowledge of bituminous coal conditions, and his ignorance of the anthracite, are primarily responsible for the attempt to join the two in one organization. If ever a fact can be established by testimony, we have established the radical dissimilarity between bituminous and anthracite mining.

We have made every effort to convince Mr. Mitchell and his friends of the utter impracticability of his scheme. Our chief objection to his organization was that it was a foreign organization, interested in a rival and competitive business. We never could see the wisdom of permitting the bituminous coal miners to inject themselves into the anthracite mining situation. It has proved to be just as mischievous as we believed it would be.

In addition to the fact that the Miners' Union was controlled by a hostile interest, we objected to it because we cannot delegate to the Miners' Union, or any other labor union, the right to determine who shall be our employees. We have the right to employ any honest man without discrimination as to religion, nationality or membership in labor organizations. This is a right we will not surrender.

We do not object to our employees joining labor organizations. This is their privilege. But we will not agree to turn over the management of our business to a labor organization, because some of our employees belong to it.

The employer ought, I think, to meet his employees personally, or a representative of such employees, provided such representative acts only for the particular

employees, and does not act in the interest of persons who are not employees of the particular company.

Restricting Output.

The fact that the organization does restrict the quantity of coal a man may mine is clearly proven. It is defended as right and just. Restriction on production limiting the quantity a man shall produce seems to be based on the theory that this is essential to give employment to the many. The illustration given by one of the miners' attorneys was that if there is only a loaf to divide you must divide it equally, and give no one more than his just proportion. The illustration is fallacious in this that it is not germane to the subject.

Labor is not a division of an existing thing. It is the power which produces things. It is not the loaf, but that by which in its various forms the loaf is produced. Any restriction, therefore, on exertion must necessarily reduce the number of loaves which are essential to feed the hungry. To limit the right of exertion—or work—is to limit production.

The ultimate effect of restricting production, so as to divide employment and increase wages, must be to keep on dividing the wages fund as often as new men seek employment. There must be a limit to an increase of wages, but there can be no limit to the increase of workmen. The process must inevitably lead to the destruction of the industry, or the reduction of the wages of every man to a sum barely sufficient to sustain life.

Wages can only increase when each individual is left free to exert himself to his fullest capacity, thereby creating wealth which in turn gives new employment—creates demand for commodities and demand for workmen to produce them.

Concerning Monopolies.

Now, sirs, if we are overanxious about the effect of possibilities of monopoly (I say possibilities because it is not probable that in a rich, energetic country like ours any such industrial monopolies can be either created or maintained) what must be the measure of anxiety as to placing the control of the fuel of the country in one organization, and that, too, an organization without capital or responsibility? Without a dollar invested in property, the fuel of the country has been absolutely monopolized. Not a ton of coal could be mined in the United States without the consent of the United Mine Workers of America, unless it was mined protected by guns. Is this a serious situation? The dangers from combinations of capital are mere possibilities, but the results of the fuel monopoly are actual.

But some will say, direful as these results have been, the operators could have averted them. How? By a surrender to unjust demands? The evil day could have been postponed. But is cowardly surrender a characteristic of American citizenship?

The Civil War could have been averted, had we surrendered to the Southern Confederacy. Let us not deceive ourselves. Men charged with the management of property, conscious of no wrong doing, believing that they are dealing justly with their employees, ought not to surrender at the dictation of labor leaders, whose reputation and subsistence depend upon their success in formulating impracticable demands, and thereby stirring up strife.

The record shows that an honest effort was made to convince the United Mine Workers that their demands were unjust. Who, now, will say, in the light of the testimony, that the demand for a uniform rate of wages, extending all over the anthracite regions was reasonable? The difference in conditions between the anthracite operations and the bituminous operations were clearly pointed out to these labor leaders.

Mr. Baer then reviewed the arbitration proposition made by the United Mine Workers on May 8, and in a summary of it, said:

Human ingenuity could not devise a proposition more unfair. It proposed an arbitration board to be selected by the industrial branch of the National Civic Federation. The industrial branch of that federation is composed of the leading labor leaders of the United States. There is not a single representative of the anthracite mine owners on it. The same industrial branch had utterly failed in the conferences we already had with it. Failed because of the crucial test, they abandoned their work, folded their tents and fled like Arabs from the field.

Can any righteous man find fault with us for not trusting our cause to their tender mercies? The alternative proposition was to submit our cause to another committee in whose selection we had no choice—a committee composed of two distinguished prelates, experts, no doubt, in matters spiritual, but just in the proportion that they have given attention to things spiritual, they could not be experts in the complicated temporal affairs of this busy world.

These learned prelates were to pass upon the wages and conditions existing in the anthracite fields—not for the purpose of determining whether, under the controlling business conditions in the anthracite fields, through which wages are regulated, the wages were fair, but to decide the startling proposition as to whether they were sufficient to enable the mine workers "to live, maintain and educate their families in a manner conformable to established American standards and consistent with American citizenship." A more impracticable suggestion was never formulated.

Mutual Interests of Producer and Consumer.

If the anthracite mine operator fixes a price on anthracite coal so high that the manufacturer cannot use it, the manufacturer will purchase bituminous coal, or if that cannot be had in the locality of his manufactory he must abandon his manufactory and go to some other point in the country where fuel can be cheaply had.

It is fortunate for the public situation that the coal properties are so largely identified with the transportation companies. If the prosperity of the towns and manufactories throughout Eastern Pennsylvania is limited the traffic is taken away. The prosperity of Eastern Pennsylvania is largely dependent upon cheap anthracite fuel, and it is to the interest, therefore, of the Reading system to keep down that price so far as practicable for the benefit of the general public—it, in turn, receiving its reward in the prosperity common to all, in which it will have a share.

You see, therefore, the conditions are such that the public consumer must be taken into consideration in the determination of the question that is before you. If by any award you may make you increase the cost of production, just so surely you increase the cost of fuel to the consumer. That, in its turn, affects every industry in Eastern Pennsylvania, and in the seaboard States.

Wages.

1. The testimony clearly shows that the wages now paid are fair wages; that they compare most favorably with the general wages of the country, and that men willing to work honestly and exert themselves, do earn annually, sums in excess of the average.

2. The fact that there is an excess of labor in the anthracite regions confirms our theory that the wages are already high as compared with the general wage scale of the country, because every one knows that labor is attracted to the place where wages are highest.

3. If the wages are again advanced, then, instead of diminishing the existing excess of workmen, it will be increased by new workmen coming to this field. Something has been said about the operators importing foreigners. I never heard of it before. These foreigners come here because of the reports made by the men already here of the improved conditions, and they will continue to come so long as such exceptional advantages are offered.

4. A higher rate of wages will tend to still further reduce the output of the mines. There is always a percentage of men who are not thrifty, and care only to earn enough money to meet present wants. If they can, therefore, earn in three days enough to support themselves for a week, they will only work three days. This, perhaps, is a small percentage, but a few men's absence may stop the work of a colliery.

Eight-Hour Day.

The demand for an eight-hour day is only another form of increasing the cost of production. This question has been fully argued before the commission. It must be apparent to everyone that restricting breaker operations to eight hours per day must necessarily limit the output of the colliery, and to that extent must not only decrease the wage fund payable to the miners, but it will decrease the supply to the public, and tend to increase the price of coal.

It has been suggested that that can be overcome by enlarging collieries. Yes! Anything can be overcome, if overcoming it means only an expenditure of money; but it cannot be overcome in an economic sense. New breakers would involve new shafts and greater hoisting capacity. In other words, any reconstruction of the collieries, costing, possibly, on an average, one-half million of dollars for a colliery, means new investment, and the payment of interest on new capital, which at once increases the cost of production.

And, this to be done, why? Not because ten hours' work per day in a breaker is unreasonable, but simply because, on some general theory of uniformity, the labor leaders of the United States have made up their minds that the battle cry of labor shall be eight hours' work per day without regard to conditions and circumstances. There are, doubtless, many vocations where eight hours per day is a reasonable limit. So far in the anthracite regions the average has not reached that; but I protest, on general principles, against the theory of limiting the hours of work to eight hours per day.

Ten hours is not an unreasonable length of time for man to work in the breakers of the anthracite coal fields, and we are to deal with the subject before us and not with some theoretical idea as to what, under a new order of things, would be a reasonable restriction of hours of labor.

Offer of Increased Wages.

After reviewing the sliding scale, Mr. Baer put before the Commission the following proposition:

That the rate of wages now paid shall be the minimum basis for the next three years; that from the 1st of November to the 1st of April, 1903, all employees, other than contract miners, shall be paid an additional 5 per cent.

That on and after April 1, 1903, for each five cents in excess of $4.50 per ton on the average price realized for white ash coal in the harbor of New York, on all sizes above pea, wages shall be advanced 1 per cent.; the wages to rise or fall 1 per cent., for each five cents increase or decrease in prices; but they shall never fall during the next three years below the present basis.

The average price for each region to be ascertained by a competent accountant, to be appointed by Judge Gray, chairman of the commission, or, in case, for any reason, Judge Gray cannot act, then by one of the United States Circuit Court Judges holding courts in the city of Philadelphia. The compensation of the accountant to be fixed by the Judge making the appointment, and to be paid by the operators in proportion to the tonnage each mines; each operator to submit a full statement each month to said accountant of all sales of white ash coal, and the prices realized therefrom, f. o. b., New York, with the right of the accountant to have access to the books to verify the statement.

Railroad Signaling in Wisconsin.*

The automatic system does not to any great extent permit of a reduction in the force of operators employed. The installation of this system on single track is not warranted unless a large number of trains are run and the track is worked very near to its full capacity. With double track, however, there are great advantages in using this system, as the length of the blocks controls the number of trains that can be run, and by making these short—which can be done at slight additional expense over what the longer block will cost—a larger number of trains will be run in a given time with corresponding increase of efficiency in the train service. In the automatic system, the several parts are all designed to cause the signal to show, stop, in case any of the parts should fail, and a failure of this signal does not create a condition which might lead to an accident, but is entirely on the side of safety. But the objection has been urged by many experienced operating officials that on account of there being no operator at hand to report a failure of the trainmen to obey the indication of the automatic signal, that they disregard its stop indication sometimes and finally get careless, with the result that an accident happens sooner or later, and, although the system was not at fault, the accident occurred. This objection is a strong one, and is to be overcome only by strict discipline on the part of the company where these signals are used. If the men know they will be discharged for running by an automatic signal when they should not, it is a powerful incentive to keep them watchful and observant of the indications of the signal. By properly putting the signal in the stop position for an occasional test, and watching if the trainmen obey the indications and make the stop, a check is readily put on the men and proper discipline in regard to the signal is easily maintained.

On single track lines where trains may come into head-on collisions with each other, a system more positive in its working than any that have been described is absolutely necessary and must be so arranged as to make it practically impossible to allow two trains running in opposite directions to enter the block at the same time. The [electric] Staff system, which is extensively used in England and is being used at many places in the United States, will fulfil these conditions. A set of these instruments is in use on the C., M. & St. P. Ry. between Beloit, Wis., and Rockton, Ill.

The staff system is particularly adapted for use in places where two or more roads are running trains on the same piece of single track, as with this system it is not necessary to issue train orders or to have a register checked over, and the time required for these operations may be saved. With the staff system perfected so that staffs may be delivered and received from fast moving trains—and an arrangement for this purpose is now being used by several roads—this system will be more generally used than it is; for, with the increasing number of trains on our single track lines and the time required to send and deliver train orders, some system must be used which will reduce these delays; or else the road must be double-tracked in order to handle the business.

Coroner's Verdict on the Westfield Collision.

At Plainfield, N. J., on Saturday last, the Coroner's Jury which investigated the collision of Jan. 27 in which 22 persons were killed, rendered a verdict that the collision was caused by the failure of Engineman James H. Davis to observe the signals. The verdict describes the four warnings, as reported in our account of the collision (Feb. 6, page 96), and also a fifth warning, the red lantern at Cranford station, two miles back of the distant signal, which was put out as a train order signal. The distances named are not precisely the same as those which were given in the *Railroad Gazette*, but the differences are not great. (Our own figures were obtained from an officer of the road who was in a position to know the true facts.) The verdict says that although neither the railroad company nor any official can be held criminally responsible "there are certain mitigating circumstances in regard to the action of the engine driver;" and then it goes on to tell how the engine leaked steam and made it sometimes difficult to see signals, and how the express train usually had a clear track at the point where on this occasion the preceding train was stopped by reason of a hot journal. The signals are described, and the report says that "this system [the electro-pneumatic block system] is said to be one of the best installed on any railroad. . . . The Central Railroad Company of New Jersey and the other trunk lines have probably reached the limit in providing the best possible system for the running of trains by usual signals, but they have not yet succeeded in reaching a point to cover human fallibility at critical moments."

All other questions are omitted from the discussion.

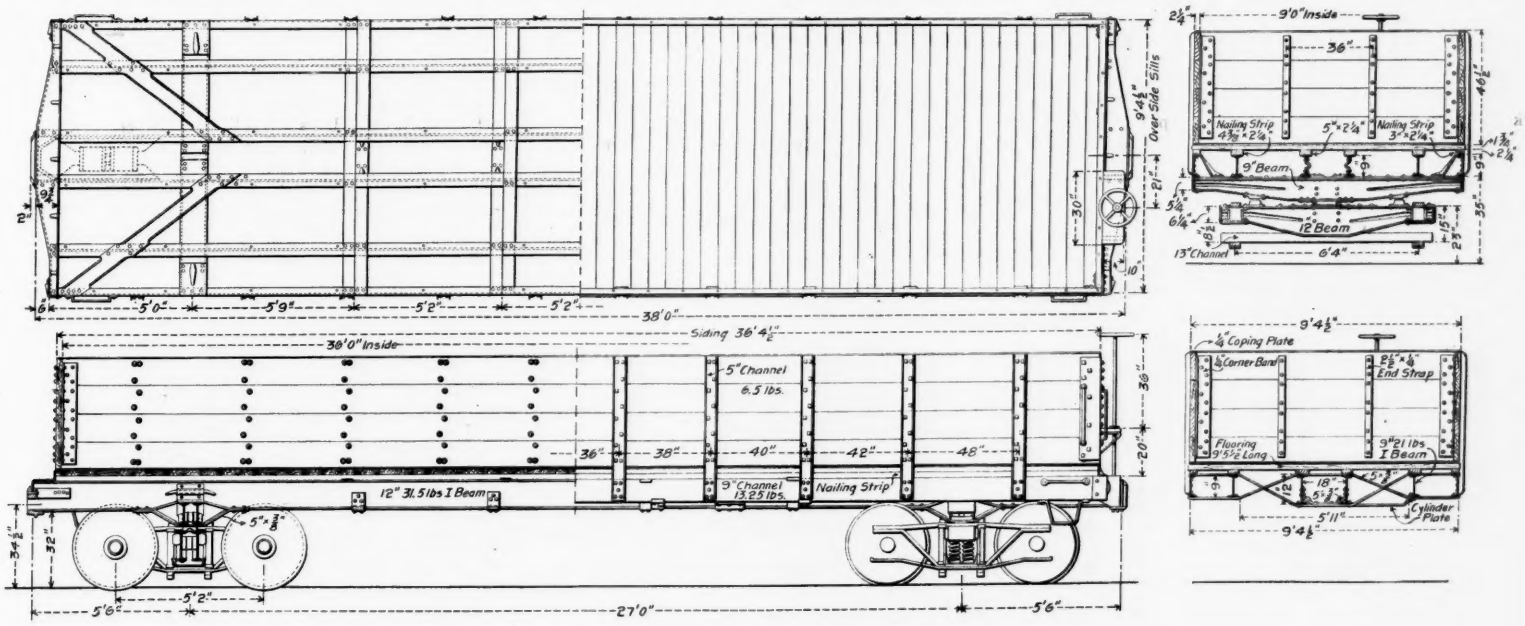
*Extracts from an article in the biennial report of the State Railroad Commissioner of Wisconsin, by Mr. W. H. Elliott, Signal Engineer of the Chicago, Milwaukee & St. Paul Railway.

the report at this point calling for a State railroad commission. This commission, says the jury, should ascertain the facts "as to whether all stoves should be prohibited and all passenger cars heated by steam from the locomotive; if locomotive headlights should not be electric, or safer than oil lamps; if there should be another man in the cab whose sole duty would be to look out for signals, and a stricter observance of rules relating to the latter be insisted upon, and if railroads should not adopt some one of the automatic safety devices which actually shut off the steam, apply the brakes and stop the train if the track is blocked or out of order."

Bettendorf 40-ton Gondola With Steel Underframe.

With the exception of the old tubular cars which have long since died a natural death, steel and composite wood and steel cars may be divided into two general classes, those built of the so-called structural shapes and those built of pressed shapes worked hot from plates into the forms required. There is shown in the accompanying engravings a type of car designed and built by the Bettendorf Axle Co., of Davenport, Iowa, which is a compromise between the two. Structural shapes, I-beams, channels and angles are pressed into the peculiar forms desired. In the process of manufacture great care is taken in the selection of the steel and in the heating and annealing. Hydraulic presses and dies are used in making the desired shapes and the company claims that the strength of the steel is in no way impaired, but on the contrary is increased by the working and subsequent annealing.

The body of the car differs but slightly from that usually found in cars of this class. The inside dimensions are, length 36 ft., width 9 ft., height of side 46½ in. Ten 5-in. channels are used on each side as side stakes, riveted to the channel side sills on the outside. The sides and ends are of planks, 2¼ in. thick. These



Plan, Elevation and Sections of Bettendorf 80,000-lb. Gondola Car with Steel Underframe.

are permanent and fastened to each other at the corners by inside and outside corner bands, making a substantial and rigid body. Nailing strips, 4⅜ in. and 3 in. x 2¼ in., are bolted on top of the longitudinal sills and the flooring, 1¾ in. thick, is nailed to them.

The interesting feature of the car is the underframe which is built up of channels and I-beams. Nine inch I-beams are used for intermediate sills and 9 in. channels with the flanges on the inside, for side sills. These rest directly on the body bolster, riveted and braced to it. The center sills are 12 in. I-beams 31.5 lbs. to the foot. Over the bolster the web has been compressed to reduce the height to 9 in. by forming a rib projecting inward. This gives the center sills the same depth over the bolsters as the lighter sections used in the intermediate and side sills. The cross section shows this construction very clearly. A 5 in. x ⅝ in. strap is carried under the bolster and riveted on either side of it to the bottom flange of the sill, securely tying the two members together. Plates bent to the shape of the rib formed in the web are riveted on the inside face of the web to reinforce the sills at their weakest point. This construction allows the use of heavy center sills to transmit the longitudinal stresses induced in long trains and the use of lighter sections for the other sills with a consequent saving in weight and reduction in the height of the center of gravity of the whole car, which is an important element in any design. In some other cars built by this company, 15 in. sills have been used and the web cut out to allow the bolster to pass through the sill instead of the sills passing through the bolster. Heavy reinforcing plates are riveted around the opening and the center plate is riveted to the bottom flanges of the center sills instead of the bolster.

The end sill is a heavy plate bent in the shape of a Z bar, 9¾ in. wide at center and tapering to 3¾ in. at the side sills. A cast-steel or malleable iron striking plate is riveted on the face of the sill at the center, serving as a chafing iron and carry iron and transmitting the buffing shocks directly to the center sills. End sill and bolster braces of 9 in. x ⅝ in. plate are riveted to the side sills just back of the end sill and are carried back over the top of the intermediate sill to the center sills just beyond the bolster. The edges are bent up to form channels, 6 in. wide, in the spaces between the nailing strips and the shoulders thus formed take the place of nailing strip brackets, preventing any dislodgment of the strips from the sills. Cross ties of 5 in. x ⅜ in. straps extend across the car at four points between the bolsters. Each of these is made of two straps, side by side, one passing over the side and intermediate and under the center sills and the other passing under the side and intermediate sills and over the center sills.

The body and truck bolsters are similar in design. In the body bolster, two 9 in. I-beams are compressed at the ends to a depth of 5¼ in. and riveted in position side by side with end plates which are bent over the top and bottom flanges. The ribs formed in the web are placed inside. A strengthening web or spider is built in between the beams around the king bolt. In the truck bolster two 12 in. I-beams are treated in the same manner, being compressed to 6¼ in. at the ends. A top cover plate is added to give the necessary strength. The compression in both bolsters affects the web and bottom flange of the beams only, the top flange remaining flat.

Some of the general dimensions of the car are, capacity 80,000 lbs.; cubic capacity, with 30 deg. heap, 1,606 cu. ft.; length over end sills, 38 ft.; width over all, 9 ft. 9 in.; extreme height, 8 ft. 4 in.

The Present Status of the Waste-Heat Engine.

The accompanying table gives a list of the important installations of waste-heat or cold-vapor engines in Germany and elsewhere. As will be seen there are at present in use or in process of construction some 2,000 h.p.

The principle of using exhaust steam to evaporate a liquid having a lower boiling point than water and using the same in an auxiliary engine is by no means new. As early as 1842 Du Trembly* patented in France an engine in which ether was substituted for water, being evaporated in a vessel placed within a steam boiler. Five years later he brought out the "binary engine," in which steam from an ordinary engine evaporated the liquid ether. Up to 1859 eight vessels were equipped with an aggregate horse-power of about 2,800. One of these, the "La France," was burned in the harbor of Bahia from the escape of the vapor, and as a result the engines were removed from the other vessels.

In 1872 Mr. J. H. Ellis designed and patented a similar engine, using carbon bisulphide instead of ether. Messrs. Poole & Hunt, of Baltimore, undertook to place the invention upon the market and tests were made which indicated great savings. But like the earlier engine of Du Trembly, it soon passed out of existence, the direct cause being due no doubt to a bad explosion in which Mr. Poole nearly lost his life.

Within the last few years the utility of the cold vapor engine using sulphur dioxide (SO_2) has again been seriously considered, and through the primary efforts of Prof. Josse,† of the Royal Technical High School, Charlottenburg, a number have been installed and are reported to be giving satisfactory service.

The thermodynamic aspect of the question is well understood by engineers and success or failure would seem to depend upon its practicability, its freedom from dangerous explosion and its continuity of action.

Dr. R. W. Thurston in the December issue of the *Journal of the Franklin Institute* covers the various phases of the question at length. He concludes that it has been fully established by frequent experiences that the multiple-vapor engines permit of some gain in efficiency and that the lowest record of steam consumption stands to the credit of the binary-vapor engine at 8.36 lbs. per horse-power per hour.

List of Waste Heat Engines in Use or in Construction in Germany and Elsewhere.

IN USE.

No.	H.p.	Diam. of Cyl.	Stroke.	R.p.m.	For whom:
1..	60	265 mm.	500 mm.	150	Mechanical Laboratory of Kgl. Technische Hochschule Charlottenburg
2..	175	450 "	500 "	125	Berliner Electricitäts Werke
3..	130	400 "	700 "	110	Briggs Bros. & Co., Markl, near Warsaw
		IN CONSTRUCTION.			
4..	150	420 "	700 "	110	Dikkers & Co., Hengelo, Holland
5..	150	420 "	700 "	110	Camphius, Zaardam, Holland
6..	200	420 "	800 "	120	Paul Steinbock, Frankfurt a. Oder, Germany
7..	400	560 "	900 "	120	Spinning & Weaving Mill, Steinen et Steinen, Switzerland
8..	400	600 "	1,000 "	90	Spinning Mill, Ellermark, near Gronau, Westphalia
9..	175	...	...	...	Düsseldorfer Röhren & Eisenwalzwerke, Düsseldorf-Oberlik, Germany
10..	200	...	...	...	Combined Gas-Heat Engine for the new Central Lighting Plant, Polytechnicum, Charlottenburg, Germany

An English View of the Steel Corporation.

The expansion of trade, especially of the steel trade, in the United States during the past few years has been enormous. It is one of the most striking things ever seen in the history of modern industrialism, vast as have been some other developments. A prohibitive duty has prevented competition from abroad, and the combination of steel-makers have kept prices at a very high level.

The question that the directors of the United States Steel Corporation have doubtless often asked themselves is, "Can these things last?" or rather, perhaps, "How long will these glorious conditions survive?" If we allow that the demand for steel is not likely to slacken—and it is a somewhat bold assumption, unsupported by precedent—if railroads are to continue to grow at the same rate; if steel buildings, steel bridges, steel wagons, and even steel ships are to multiply as they have done during the last four years; is there no fear of home competition? Even if we put that on one side, is there no probability that the people at large—impatient that they should be taxed to enrich the proprietors of an industry no longer "infant," and quite capable of standing on its own merits—is there no probability that they will insist on the prohibitive duty being lowered, not with a view to bringing in foreign steel, but simply to reduce the price of the home product?

One can hardly imagine that accomplished business managers, such as the directors of the Corporation undoubtedly are, have not often canvassed these three possibilities—the falling off of demand, home competition and the reduction of duty. Perhaps they have thought the possibilities are even probabilities, more or less remote. In that case they have wisely recognized the need to strengthen the foundations of their corporation, for every manufacturing business rests chiefly on the energy, ability and zeal of those who carry on its operations. It was the shrewdest and most successful steel-maker that ever lived, Mr. Carnegie himself, who said that his staff was equal in value to his plant.

The (profit sharing) scheme now put forward is naturally not one of complete co-operation. That, of course, would be incompatible with the origin of the corporation and the existence of the 55,000 stockholders. Moreover, the average workman in America is hardly educated up to such responsibilities, even if the plan were feasible in other respects. But in the higher branches

*See Proceedings Am. Soc. M. Eng., Vol. VII., p. 682.
†See *Railroad Gazette*, Nov. 9, 1900, p. 746.

of the personnel we have here the principle of co-operative production established to an extent that is not without precedent, but which has not been yet tried on so large a scale. But even in the lower ranks, down to the men of pick and shovel, the wisdom of enlisting their sympathy is recognized; and though they have not a direct interest in swelling the profits, so long as the 7 per cent. on the preference shares is assured, they are made to feel the dignity and responsibillty of proprietorship. That this means far more than used to be thought is a fact that the modern school of businessmen are happily fast recognizing.

For a time the working proprietors of the United States Steel Corporation may not represent a large element in the organization, but there are the possibilities of growth in the scheme, which at a future date may change the entire aspect of the business. It is like a snowball, that will grow as it rolls—unless a thaw should set in.—*Engineering.*

New Roundhouse of the New York Central at Rensselaer.

The New York Central has recently built a new passenger engine roundhouse for the Middle Division at Rensselaer, New York. For the present but 30 stalls have been provided, but by the addition of sections B and C, the ultimate capacity can be increased to 60 stalls.

The roundhouse and attendant facilities were completed within the remarkably short time of 60 days. The auxiliary departments include a blacksmith shop, 30 ft. x 30 ft.; machine shop, 39 ft. x 110 ft.; two offices, each 20 ft. x 20 ft.; rest room, 20 ft. x 34 ft.; store room, 30 ft. x 60 ft.; oil room, 20 ft. x 40 ft.; boiler room, 35 ft. x 44 ft.; coal bin, 23 ft. x 43 ft., and casting shed, 12 ft. x 104 ft. A modern coaling plant is also to be erected. The coaling is now being done by hand from a temporary platform. At the present time from 100 to 140 engines are handled a day, but it is stated that these figures can be nearly doubled when the new coaling plant is completed.

Two incoming tracks are provided, each of which passes over an ash pit. These pits are as close to the roundhouse as possible, which conforms to the recommended practice* of the American Railway Master Mechanics' Association. Two outgoing tracks are also provided, but the arrangement of water cranes and coal chutes is such that great flexibility is possible in case of emergency.

The general design of the house conforms to the standard construction of the New York Central. In our issue of March 29, 1901, we gave a description of the West Albany roundhouses and we refer the reader to that article for many of the standard details which do not appear herewith.

Turn-table.—A standard 70 ft. turn-table designed for a total load of 200 tons is operated by a Fairbanks & Morse gasolene motor, and serves all the stalls. The turn-table pit is concrete and drains towards the center into a 2 ft. catch basin which has a 6 in. overflow pipe connecting with the main drainage system. The pivot rests on a concrete cap 5 ft. x 5 ft. x 18 in., and is anchored to the concrete foundation by four 1¼ in. bolts 3 ft. 6 in. long. Near the base of the foundation are two courses of old rails spaced 10 in. center to center. The bearing surface is 100 sq. ft.

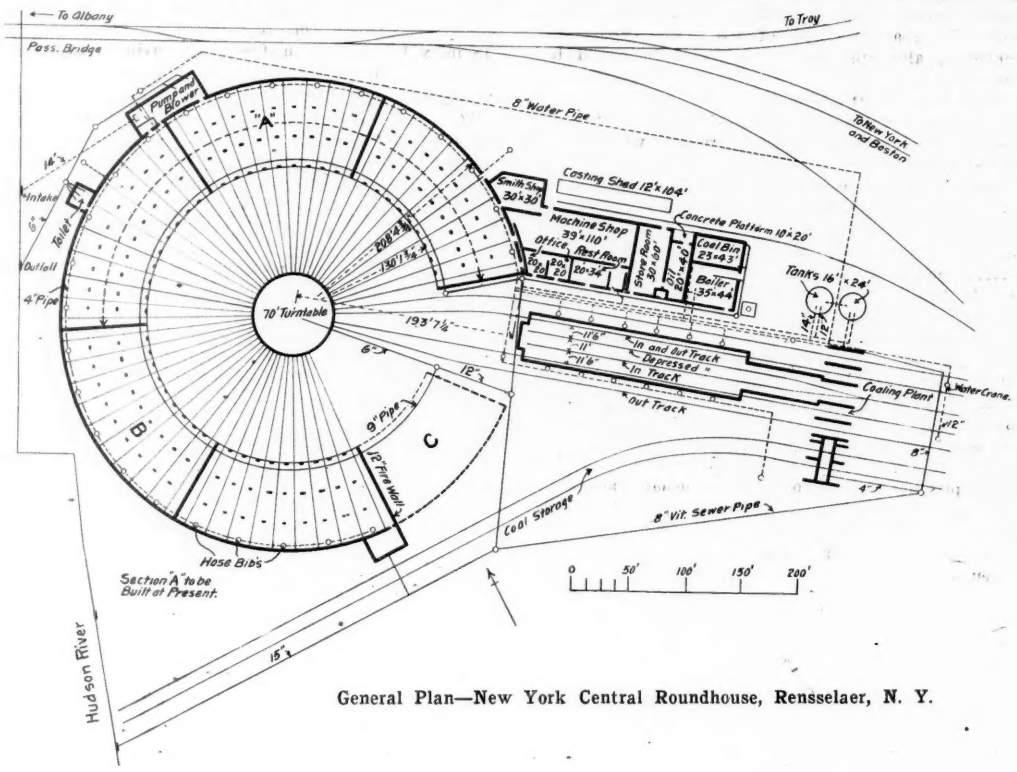
Ash Pit.—Each ash pit is 200 ft. long. The rails rest upon cast-iron pedestals 21 in. high weighing 231 lbs. each and spaced 3 ft. apart. The bottoms of the pit and outer sides are made of cinder concrete consisting of one part of Portland cement, 2½ parts of sand and 6 parts of screened anthracite coal cinders. This is reinforced by expanded metal. Directly beneath each line of pedestals is a foundation 18 in. thick and 3 ft. wide consisting of concrete mixed in the proportion of one part of cement, 3 parts of sand, and 6 parts of broken stone. This is reinforced by one course of old rails. Each pedestal is anchored into the foundation by three 1 in. bolts.

Between the ash pits are two depressed tracks with Ellis bumping posts. By reference to the engravings it will be seen that the edges of the side walls and retaining walls are protected by rails imbedded in the concrete and held in place by bent bolts. The pits drain towards the depressed tracks, which in turn drain towards one end into a catch basin connected to the sewer. Along each ash pit are six bib cocks for hose connections.

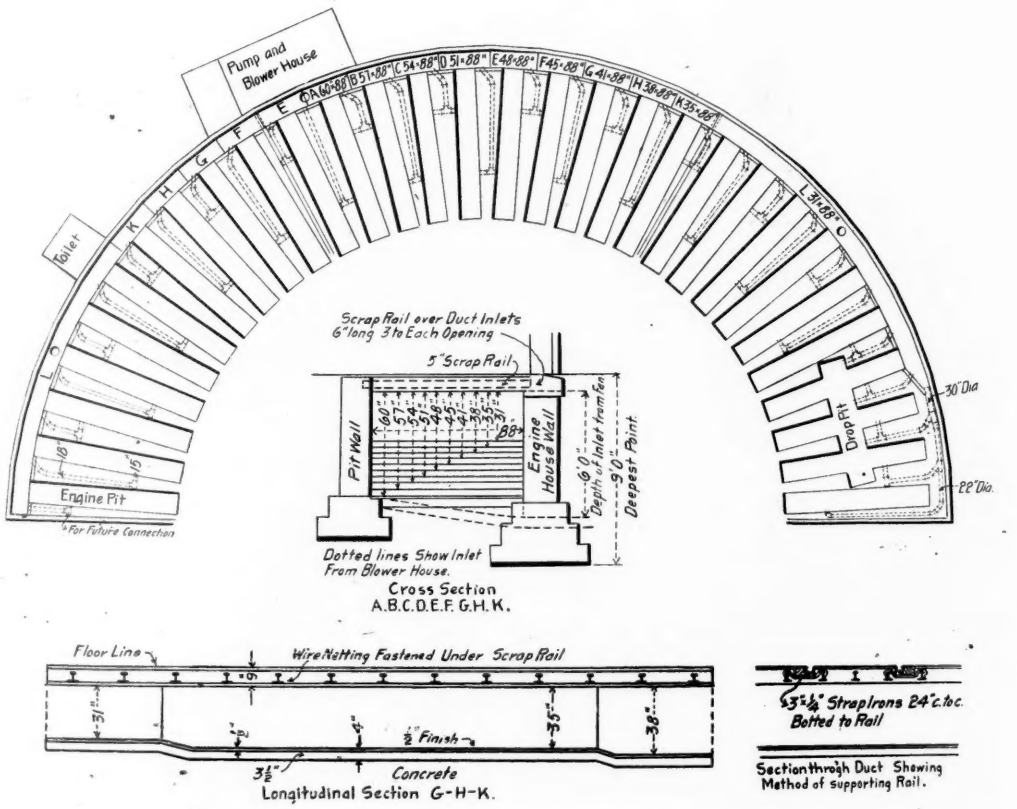
Engine House.—The radius of the inner circle of the engine house is about 130 ft. and the outer circle about 208 ft., the actual width of the house being 77 ft. 2½ in. inside dimensions. The outer wall is brick 12 in. thick and rests on a concrete foundation 6 ft. deep. The floor is surfaced with a layer of cement 1 in. thick underneath which is 5 in. of concrete and 8 in. of cinders. The doors of the house are wood and have a clear opening 12 ft. wide and 15 ft. 6½ in. high. The doors are swung on hinges fastened to 12 in. x 12 in. wooden posts, which latter also support the inner line of the roof. These posts rest on concrete foundations.

The roof is made of 2 in. tongue and groove planks covered with pitch and gravel and the coping is vitrified tile. The roof purlins are 3 in. x 14 in. yellow pine from the inner circle to the first line of 10 in. x 10 in. columns; between the first and second line of columns the purlins are 4 in. x 14 in., and between the second line and outer wall, are 6 in. x 14 in. The rafters

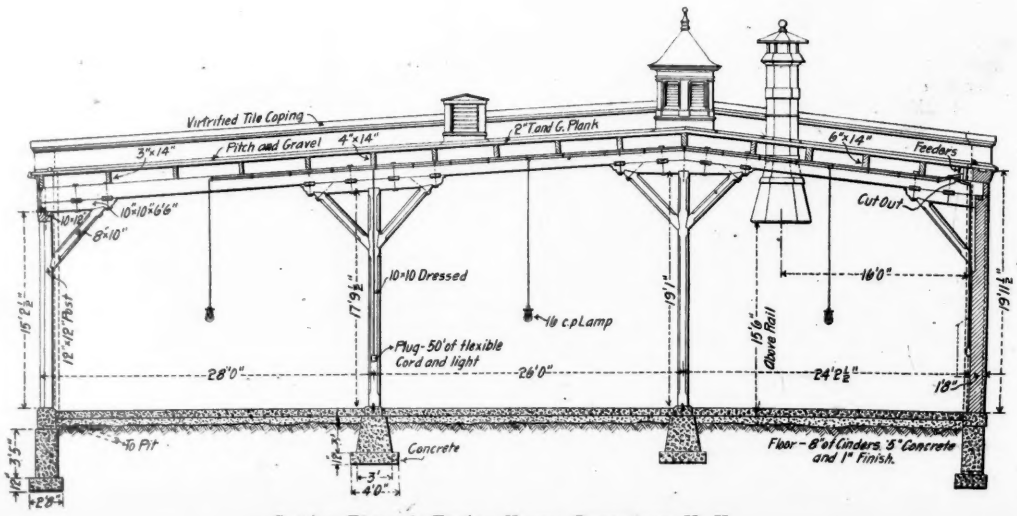
*See *Railroad Gazette*, June 27, 1902.



General Plan—New York Central Roundhouse, Rensselaer, N. Y.


Pump and Blower House
A 60'-88" B 51'-88" C 54'-88" D 51'-88" E 48'-88" F 45'-88" G 41'-88" H 38'-88" K 35'-88"
Toilet
Engine Pit
For Future Connection
30' Dia
Drop Pit
22' Dia.
Scrap Rail over Duct Inlets 6' long 3 to Each Opening
5" Scrap Rail
Pit Wall
Engine House Wall
Depth of Inlet from Rail
9'0" Deepest Point.
Dotted lines Show Inlet From Blower House.
Cross Section A.B.C.D.E.F. G.H.K.
Floor Line
Wire Netting Fastened Under Scrap Rail
½" Finish
Concrete
Longitudinal Section G-H-K.
3"x¼" Strap Irons 24" c. to c. Bolted to Rail
Section through Duct Shewing Method of supporting Rail.

Arrangement of Heating Ducts.



Section Through Engine House—Rensselaer, N. Y.

are 10 in. x 14 in. dressed oak timbers. The smoke jacks are hexagonal in form and are made of white pine thoroughly seasoned and painted on the interior surfaces with three coats of fire-proof paint. In order to resist corrosion, all nails and screws are copper and brass respectively.

Between each 10 pits is a 12 in. fire wall dividing the house into sections. At every alternate pit is a stationary vise and each section is provided with one large portable vise.

The pits are of the usual standard concrete construction, having rounded bottoms. All inside pit surfaces, together with the surfaces of the floor, and pedestals and the face of the water table, are finished with 1 in. of cement mortar of the proportion of one part of cement to 1½ parts of sand. The rails rest on 8 in. x 12 in. yellow pine stringers fastened to the concrete foundation walls by ⅞ in. bolts spaced 8 ft. apart. Leaders from the roof drain into each end of each pit. The pits drain toward the inner circle of the house and a 9 in. vitrified sewer pipe connects all the pits. Around the outer wall of the house is one 2 in. air pipe, one 4 in. water pipe and one 1½ in. steam blower pipe.

The drop pit is close to the shops and extends across three pits instead of two, as is the usual practice. The pit is 7 ft. wide and a narrow gage track is at the bottom. Overhead is an 18 in. I-beam, on which runs a pneumatic hoist for lifting the wheels from the pit. A pneumatic jack runs on the track at the bottom of the pit. The supporting rails across the drop pit are carried on 12 in. I-beams which can be moved to one side after the weight of the locomotive is removed. The wheels can then be dropped and run across to one of the adjacent pits.

Blacksmith Shop.—The blacksmith shop is about 30 ft. x 33 ft., with one door opening into the roundhouse, and one opening into the machine shop. The shop contains but two forges—one for the copper-smith and one for the blacksmith.

Machine Shop.—The machine shop is about 39 ft. x 110 ft., and contains the following principal tools:

1—24 in. shaper.
1—12 in. speed drill.
1—16 in. bolt lathe.
1—22 in. bolt lathe.
1—36 in. bolt lathe.
1—30 in. planer.
1—37 in. boring mill.
1—1½ in. bolt cutter.
1—2 in. pipe cutter.
1—Emery grinder.
1—Radial drill.

The shop is driven by a 9 in. x 8 in. Westinghouse Junior engine running at 350 r.p.m.

The air compressor plant is also in the machine shop and consists of an Ingersoll-Sergeant duplex compressor. A 3 in. pipe from the compressor delivers into an air reservoir outside of the roundhouse near the blacksmith shop. The air supply is drawn from this reservoir.

Next to the air compressor is a Fairbanks & Morse 18 in. x 10 in. x 12 in. fire pump having a capacity of 1,000 gal. per min. This connects directly into the 4 in. main water pipe. Around the walls of the shop are about 80 lockers. These lockers are made of 3½ in. matched boards and are 12 in. deep, 18 in. wide and 4 ft. 3¾ in. high. The floor of the shop is 3 in. x 8 in. flooring on 4 in. x 6 in. sleepers laid 24 in. on centers on an 8 in. cinder fill.

Oil Room.—The oil room is 20 ft. x 40 ft. and adjoins the store room on the east, the same lobby serving both rooms.

There are four steel tanks in this room each 8 ft. in diameter and 6 ft. high. These tanks rest on a concrete platform and contain engine oil, valve oil, signal oil and headlight oil respectively. An air hoist is provided for raising the barrels to the tanks in filling.

Boiler Room.—The boiler room is 35 ft. x 44 ft. and contains three 125 h.p. boilers furnished by the Franklin Boiler Works Company of Troy, N. Y. Space is reserved for an additional boiler if its installation becomes necessary when the engine house is enlarged. The boilers are set in two batteries of one and two respectively. The breeching is rectangular in section and is made of No. 10 B. W. G. sheet steel.

Draught is furnished by a 135 ft. 6 in. high standard self-susfained steel stack, 5 ft. 6 in. inside diameter. The base is flared to a diameter of 9 ft. The foundation consists of six courses of concrete, each course 2 ft. high, except the top course, which is 2 ft. 6 in.—the bottom course being 22 ft. 6 in. x 22 ft. 6 in. in area and the top course 12 ft. 6 in. x 12 ft. 6 in. The stack is held in place by eight 2⅜ in. anchor bolts extending to the bottom of the foundation.

The stack is built up of six sections; the first section is 30 ft. high and is made of ½ in. sheet steel; the second section is 15 ft. high and $^{7}/_{16}$ in. material; the third section is 15 ft. high and ⅜ in. material; the fourth section is 15 ft. high and $^{5}/_{16}$ in. material; the fifth section is 25 ft. high and ¼ in. material; and the top section is 35 ft. high and $^{3}/_{16}$ in. material.

The following table shows the spacing of the rivets in the stack:

Table of Riveted Joints.

Thickness of plate. In.	Diam. of rivet. In.	Diameter of holes. In.	Pitch. In.	No. of rows.	Center of hole to edge of plate. In.
½	⅞	15/16	3½	3	1½
7/16	⅞	15/16	3½	3	1½
⅜	⅞	13/16	3¼	3	1¼
5/16	¾	13/16	3	2	1 3/16
¼	¾	11/16	3	2	1
3/16	⅝	11/16	2	1	⅞

All vertical seams single riveted.

A coal bin adjoins the boiler room and has a storage capacity for 200 tons. Coal is unloaded directly into this bin from a trestle.

The boilers are fed by two Worthington duplex 6 in. x 4 in. x 6 in. pumps. In one corner of the boiler house is a hot well for the heater returns. In this well is one Worthington No. 1 duplex 3 in. x 2 in. x 3 in. pump and receiver. A similar hot well with a No. 2 Worthington pump is in the blower house. The boiler pressure is 100 lbs.

Heating System.—The heating system is well designed and is an excellent example of what is considered best in roundhouse practice. The engine house is heated by the hot air system, and all the other departments are heated by direct radiation.

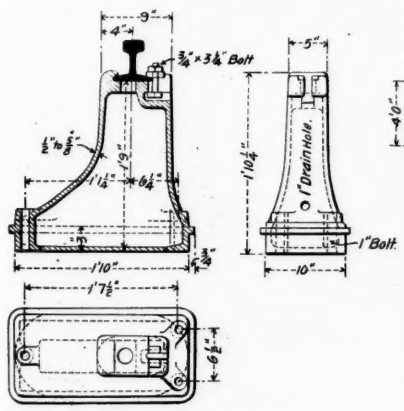
The heating fans are in a separate blower house. These deliver air into an underground duct which runs between the outer wall of the house and the ends of the pits. This duct gradually diminishes in section. The air is blown into each pit from two points, as shown. The leads from the main duct are vitrified tile pipes 18 in. in diameter, and the openings into the pits are 15 in. in diameter and are provided with thimble and damper.

The contractors for the heating system were the B. F. Sturtevant Company. The two fans are of the three-quarter housing type, and are 10 ft. x 5 ft. Each is driven by a 10 in. x 12 in. engine. The normal speed is 145 revolutions per minute, at which speed the rated delivery is 64,000 cu. ft. per min. The air from each fan is drawn past a heater containing 9,600 lineal ft. of 1 in. pipe. Several of the heater coils are arranged to receive the exhaust from the fan engines and from the water pumps which are placed in a pit within the blower house. Live steam at 10 lbs. pressure is also supplied from the boilers in case the exhaust steam is insufficient. The fans are guaranteed to change the air in the house once every 7½ minutes, and to maintain a temperature of 65 deg. when the outside temperature is zero.

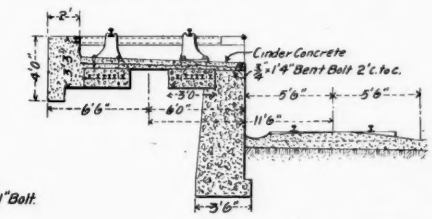
The following table gives the total sq. ft. of radiating surface in several of the shops and rooms. The coils are all made of 1½ in. pipe. In the store room the coils are placed overhead.

Machine shop	532 sq. ft.
Store room	270 "
Oil room	150 "

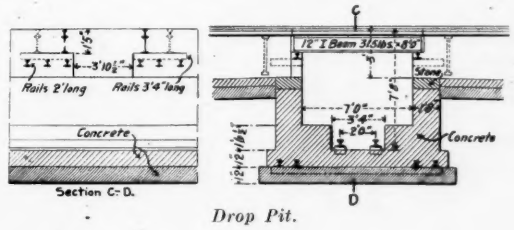
Lighting.—Three suspended 16 candle-power lamps are in each space between the pits. Each pit is also provided with a plug box fastened to one of the posts for a portable lamp, thus doing away with smoky torches when inspecting the interior of the fire-box or other dark places. A switch on the outer wall at each space is so arranged that either the lamp at the front end of the engine can be lighted or the other two, or all three. The lamps



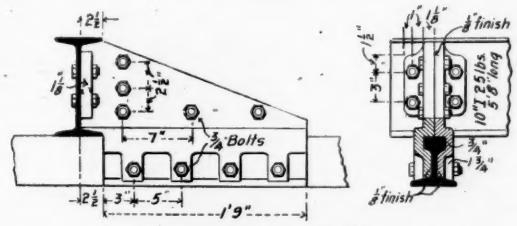
Detail of Pedestal.



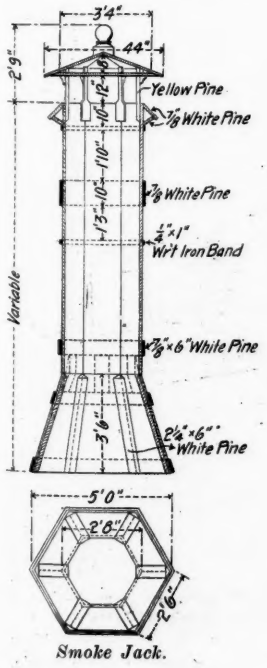
Ash Pit.



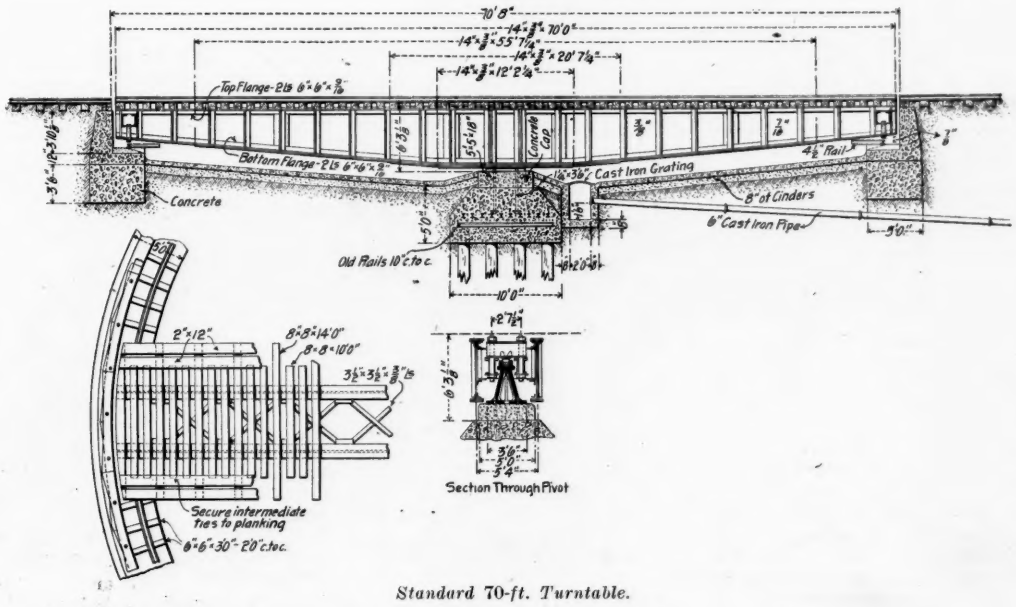
Drop Pit.



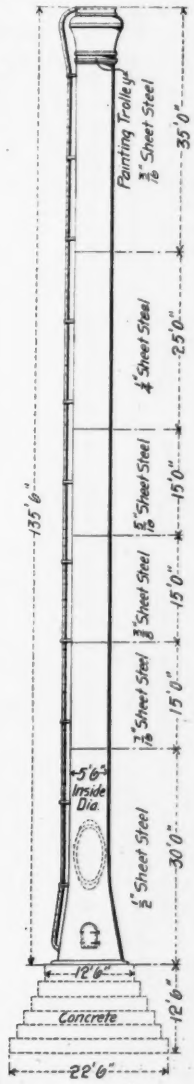
Rail Bumper for Pits.



Smoke Jack.



Standard 70-ft. Turntable.



Steel Stack.

Rensselaer Roundhouse—Miscellaneous Details.

operate from a three wire alternating current 110 volt circuit. The Albany & Hudson Railway & Power Company supplies the current and the main switchboard for the engine house is in the fan house.

At present there are 184-16 candle-power lamps and 33 portables installed, but when the other section is added there will be 251 lamps and 56 portables.

Water Supply.—The water supply is drawn from the Hudson River near by. The water flows by gravity through a 14 in. cast-iron pipe into a low level concrete cistern 20 ft. in diameter and 26 ft. deep. Two Fairbanks & Morse duplex pumps with 10 in. x 12 in. water cylinders draw their supply from the low level cistern. These pumps are in a water tight pit in the fan house. The maximum suction lift from low water elevation is 16 ft. The piping system from these pumps is clearly indicated on the general plan. The two water tanks which supply the cranes are each 16 ft. x 24 ft., and have a combined storage capacity of 100,000 gallons.

Other Facilities.—Every facility is provided for the comfort and convenience of the shop men and engineers. A large rest room for engineers contains a library of current periodicals. Modern sanitary toilets are also provided. The toilet next to the rest room is for the exclusive use of engineers.

We are indebted to Mr. W. J. Wilgus, Fifth Vice-President of the New York Central, and to Mr. C. Bond, Roundhouse Foreman, for plans and general information.

The Consulting Engineer and the Contracting Engineer.

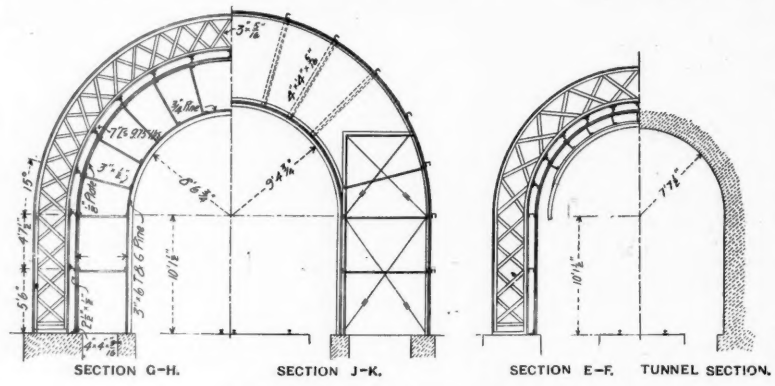
In our issue of January 2 appeared an address delivered before the stockholders of the British Westinghouse Company by Mr. Westinghouse. In that address he mentioned, among other interesting and suggestive matters, the growing tendency to put engineering design as well as construction in the hands of great firms, and mentioned specifically some of the recent great contracts of Westinghouse, Church, Kerr & Company. The same address appeared in *Engineer* (London) with a leading article, in which the editor dwelt somewhat upon this modern tendency. In a later issue of *Engineer* a writer signing himself "British Engineer" disputed the desirability of transferring to the contracting firms the special business of the consulting engineer. He says that there are two classes of consulting engineers who have done much to discredit the profession: First, men who have not been successful and who set up as consultants and for small fees undertake work which they are incompetent to deal with; second, those who look upon electricity as an adjunct to civil or mechanical engineering, and hire cheap men to design their electro mechanical work "thus placing themselves in the hands of employees." But, after all, these are only a small part of the number of consulting engineers. Most of them are competent and conscientious and useful. There is scarcely any large engineering work in Great Britain or the British Colonies which has not been carried out under the supervision of consulting engineers, and the results justify the wisdom of the practice. He does not doubt for a moment the excellence of the engineering staff of the Westinghouse Companies or the quality of the work turned out, but he doubts the wisdom of intrusting to any contractor the solution of such a question as the electrification of the steam railroads. One objection would be found in the fact that they would be likely to confine themselves to patented apparatus controlled by the contracting company.

In a later issue (January 16) Mr. Westinghouse replies shortly to this letter. He had no intention of implying that people projecting large enterprises should not avail themselves of competent consulting engineers. He did wish to convey the idea that the installation of electrical apparatus, especially for railroad purposes, involves such important departures from ordinary practice that railroad companies can better rely upon a well established, highly organized engineering concern, with a complete corps of engineers of highly varied experience and attainments. He finds that the tendency is now in this direction, namely, to give the complete contract to responsible concerns, rather than to rely upon the efforts of a single consulting engineer. The writer of the earlier letter had mentioned the case of the Manhattan Elevated in New York. Mr. Westinghouse argues that this case admirably sustains his contention. That company placed much reliance upon electrical engineers and awarded its numerous contracts to sundry firms, giving preference generally to the lowest bidder. Thus the company has assumed entire responsibility for the quality and the harmonious working of the complicated apparatus and probably has no recourse against those responsible for inadequate apparatus.

As to the point that the contracting concern would confine itself to patented apparatus which it controlled, Mr. Westinghouse suggests that the consulting engineer would be guided very largely by his own previous work. He would be a prejudiced judge of the best and most suitable material to use in any given case. He would have his special ideas and designs, some of which would be suitable in a given case and some would not. He would have his strong points and his weak points, and could not excel in all things. On the other hand, the contracting firm would have no other interests than those of its client, would carefully consider what is best for the individual case, would choose one part here and one part there as seemed desirable, and, finally, the consulting engineer would do his best work in co-operation with a responsible contracting company. "The bringing together of those who execute these large contracts and those who afterward use and maintain the apparatus has many advantages over the course usually adopted."

Annual Report of Illinois State Railroad Engineer.

Mr. F. G. Ewald, Consulting Engineer to the State Railroad Commission of Illinois, in his annual report to the commissioners, calls attention to the fact that the railroad companies report large expenditures for personal injuries and wrecks. He recommends that, for the purpose of diminishing this large element in the expense account, the railroads install the block system; and in connection therewith he thinks they ought to consider the use of an automatic stopping device. Indeed, Mr. Ewald believes such a device important and necessary, and he apparently believes that some, or all, of the contrivances now before the public are worthy of a thorough test, if not of definite adoption. The total sum paid out by the railroads reporting to the Illinois Commission, in one year, for injuries to persons, loss and damage, and clearing of wrecks, was $1,842,177. This sum includes, we suppose, the payments throughout the whole of the lines reported, a large portion of which lies outside of the State of Illinois. Whether it does or does not include the cost of repairs and renewals of cars and engines involved in wrecks does not appear. Mr. Ewald repeats his former recommendation that interurban electric railroads be placed under the jurisdiction of the Railroad Commission. The number of interlocking plants in Illinois is now 246, with 6,681 active levers. In the year ending December 1 last there were 197 derailments at interlocking plants, of which 138 were due to trains running contrary to signals. These totals are somewhat smaller than in 1901, and are about the same as those for 1900. Mr. Ewald is revising and re-writing the elaborate records of interlocking devices which are kept in his office.



Sections Through Injector and Tunnel.

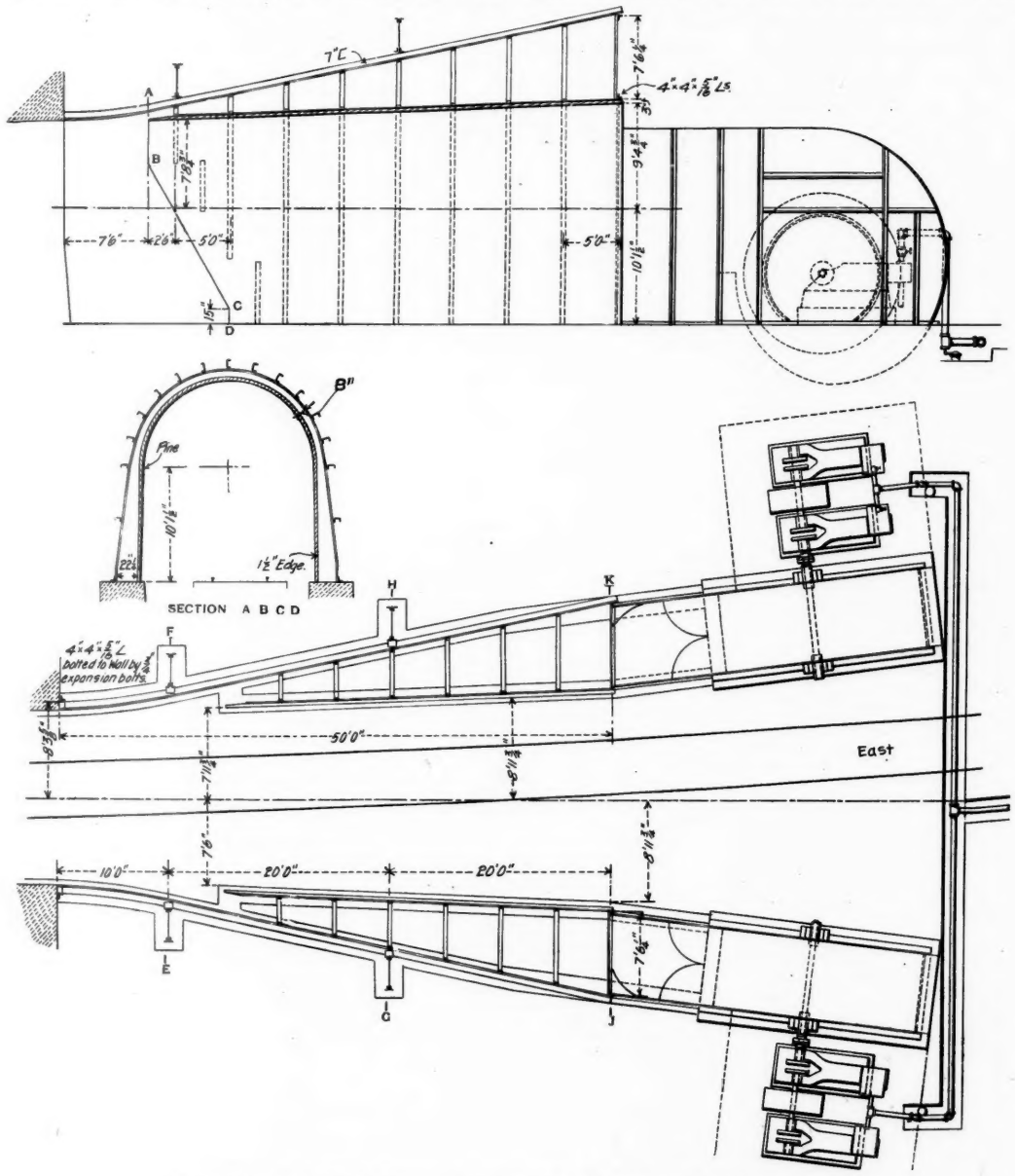
Ventilating Big Bend Tunnel on the Chesapeake & Ohio.

The Big Bend tunnel of the Chesapeake & Ohio Railway near Hinton, W. Va., has just been equipped with a ventilating plant. The tunnel is 6,500 ft. long, arched with brick and has a single track. There is an up grade of 21 ft. a mile from the west end of the tunnel for two-thirds of the length and then a down grade of 4 ft. a mile. The monthly traffic through this tunnel is about 950 freight trains and 240 passenger trains. The average load of the eastbound freights is 1,928 tons and of the westbound 755 tons.

An induced current is produced in the tunnel by injecting air at a high velocity around the sides and top of the tunnel at one end, as shown by the accompanying engravings. This is the Churchill-Wentworth system, which was first used at the Elkhorn tunnel on the Norfolk & Western and described in the *Railroad Gazette* May 10, 1901.

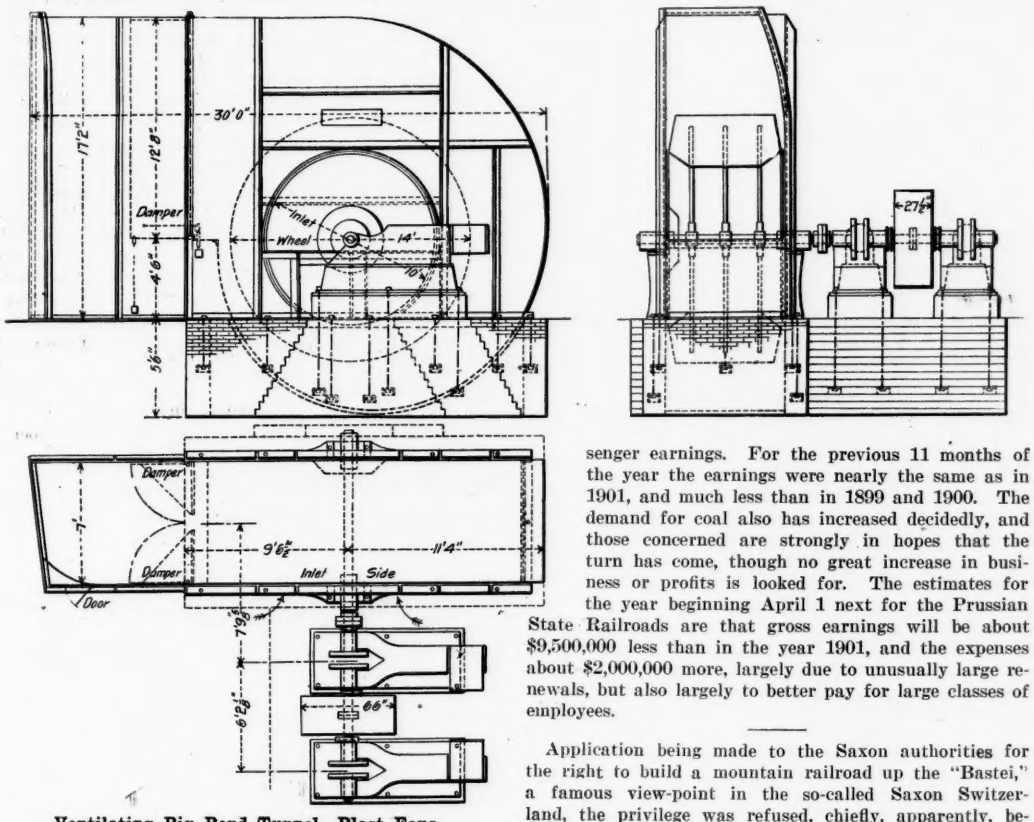
Two fans furnish the blast for the Big Bend tunnel. Each fan is coupled with two 12 x 14 in. center-crank engines; the fans are 14 ft. in diameter and 7 ft. wide. The steam is furnished by two Babcock & Wilcox water-tube boilers rated at 200 h.-p. The boiler plant is furnished with mechanical draft apparatus, and is so designed that either natural or mechanical draft may be used as occasion demands. The fans are designed to deliver through the tunnel a current of air of 1,600 ft. a minute, but the present boiler capacity is such that a current of only 1,200 ft. a minute can be attained.

The fans are at the east end of the tunnel and blow against the heavily loaded trains coming up the grade. The fans at the Elkhorn tunnel blow with the heavier



Ventilating Big Bend Tunnel—Arrangement of Blast Fans and Injector.

trains. Owing to the length of the Big Bend tunnel it was found necessary to have the fan blow against the trains ascending the grade, as, if it had been placed at the other end, it would have been necessary to reduce the speed of the trains to 1,000 ft. per minute in order to make sure that the smoke of hard working engines should be blown forward (the speed of the current produced by the fan is 1,200 ft. per minute), and hence only



Ventilating Big Bend Tunnel—Blast Fans.

one train could be passed through the block every 15 minutes. With the present arrangement, trains can be run at a speed of 2,000 ft. a minute, which permits one train to pass through the block every seven or eight minutes. The length of the block, including 4,000 ft. outside the tunnel, is two miles.

The inventors of this system have deduced formulæ applicable to their design. Several of these formulæ were given in the *Railroad Gazette* in connection with the Elkhorn description. We are now told that these deductions have been extended and include formulæ for the necessary ratio between area of blast outlet and tunnel section for tunnels containing two or more tracks and with a train or trains therein.

Mr. C. E. Doyle, General Manager of the Chesapeake & Ohio, supplies the above details.

Foreign Railroad Notes.

A significant feature of the bills of some of the English railroad companies for the coming session of Parliament lies in the fact that in many cases there is introduced a proviso enabling them to own electrical patents, and to build power houses and other works necessary for the working of their lines by electricity. No immediate change is contemplated, but they desire, when the time comes, to have the powers necessary to begin operations at once.

The first of the larger English railroads to announce its dividend is the North Eastern, and the announcement is most satisfactory since with only a gross increase of about £48,000 the company is able to pay ¼ per cent. more than in the former corresponding half year. As has been mentioned before this company has introduced some of the American forms of accounting.

Mr. Waitt's discussion of the smokeless combustion of bituminous coal on locomotives reaches the journal of the German Railroad Union by way of Paris, where it was summarized in the "Mémoires" of the French Society of Civil Engineers.

The Prussian State Railroad administration has paid to the heirs of a victim of a railroad accident, who was a member of the Imperial Diet, the sum of $43,435, by far the largest sum ever paid in Europe, we believe, in such a case.

The Simplon tunnel progressed 680 ft. at the north end and 477 ft. at the south end in December, making 47,180 ft. of total penetration at the end of the year, leaving 17,334 ft. yet to be excavated. The discharge of water at the south end continues great. The heat at the north heading had fallen from 127 to 113 deg. Fahr. At the southern heading it was 99 deg. In January a softer rock was met at the north end, and it became necessary to support the roof. If no further unlooked for obstacles are met, it is believed that the tunnel will be completed by the end of 1904, but not at the date called for by the contract, which is May 13 of that year.

There are signs of recovery from the long continued industrial depression in Germany. The railroads of the Empire had an increase of 4.6 per cent. in freight earnings last December, and an insignificant decrease in passenger earnings. For the previous 11 months of the year the earnings were nearly the same as in 1901, and much less than in 1899 and 1900. The demand for coal also has increased decidedly, and those concerned are strongly in hopes that the turn has come, though no great increase in business or profits is looked for. The estimates for the year beginning April 1 next for the Prussian State Railroads are that gross earnings will be about $9,500,000 less than in the year 1901, and the expenses about $2,000,000 more, largely due to unusually large renewals, but also largely to better pay for large classes of employees.

Application being made to the Saxon authorities for the right to build a mountain railroad up the "Bastei," a famous view-point in the so-called Saxon Switzerland, the privilege was refused, chiefly, apparently, because such a line would be likely to attract to one point tourists who otherwise would be likely to divide their patronage among the hotels, carriages, etc., of several places of somewhat similar attractions in the same mountain district. It was also urged that none of the mountains are very high, and that their summits are reached by people of average physical powers without a railroad. (It is only about 600 ft. to the summit of the Bastei from the river at its foot.) The probability that the scenery would be injured to some extent by a railroad was also given as an objection to it.

Bridges Over the Chicago Ship Canal.

The accompanying diagram shows the position of the bridges on that part of the Chicago River which has been adopted as the channel of the Chicago Sanitary and Ship Canal. They number 28 and all are draw bridges. At some of the crossings old bridges have been or are being replaced, and some new bridges are finished, but the majority are yet to be built. Numbered consecutively from the Lake Front through to Ashland avenue, about six miles, they are as follows:

No. 1. A Swing Railroad Bridge belonging to the Illinois Central R. R., seldom or never used within the last decade.

No. 2. Rush Street Bridge.—No plans formulated but the substitution of a bascule structure by the Sanitary District is within the scope of its plans.

No. 3. State Street.—Here a Scherzer rolling lift bridge is nearing completion.

No. 4. Dearborn Street.—Swing bridge in state of dilapidation and early substitution of a bascule structure in contemplation by the district. Type not yet decided on.

No. 5. Clark Street.—Swing bridge in good repair, eventually to be replaced by a bascule structure. No plans under present advisement.

No. 6. Wells Street.—A double deck swing bridge, first deck used for street traffic, upper deck used by Northwestern Elevated Railway. Here a bascule structure does not seem practicable and the probable solution is a bridge of existing type and greater span to give required waterway. No plans under present consideration.

No. 7. Lake Street.—Another double deck bridge, all conditions same as at No. 6 and same remarks apply.

No. 8. Randolph Street.—Here a Scherzer rolling lift bridge is nearing completion.

No. 9. Washington Street.—A swing bridge with center pier on crown of tunnel. No reconstruction is contemplated here pending a solution of the tunnel problem.

No. 10. Madison Street.—A swing bridge in good repair serves this street. The substitution of a bascule structure is within the scope of the district project. No plans are under consideration.

No. 11. Adams Street.—A swing bridge with one navigable opening, west arm swings over land. The widening of the river and substitution of a bascule structure is within the scope of the district project. No plans now under consideration.

No. 12. Jackson Boulevard.—A swing bridge with but one navigable channel. Same conditions and remarks as No. 11.

No. 13. Metropolitan Elevated Road, four track Scherzer rolling lift bridge of recent construction.

No. 14. Van Buren Street.—Scherzer rolling lift bridge. This was the first of its type to be built in Chicago.

No. 15. Harrison Street.—The swing bridge has been removed and at present a temporary Howe truss bridge pivoted at the east end with the west end carried on a scow, is in service. The scow is operated by chain cables wound on a drum actuated by an electric motor. Fluctuations in water surface are cared for by four jack screws also actuated by the motor which swings the bridge. Time of opening or closing, including adjustment of scow, three minutes. This condition was brought about by legal complications which delayed the building of a permanent bascule bridge.

No. 16. Polk Street.—A swing bridge, the oldest metallic bridge on the river. A plate girder trussed with cables from struts on the center of the girders. Plans for a Scherzer rolling lift bridge have been adopted, but building is delayed by the conditions at Harrison street, as it is not the policy of the district to build two adjacent bridges at once; this in the interest of city traffic.

No. 17. Taylor Street.—A Scherzer rolling lift bridge built by the district.

No. 18. The Chicago Terminal Transfer Bridge, built by the district. Scherzer type, span of 272 ft., center to center of bearings.

No. 19. Twelfth Street.—A swing bridge; to be replaced by a bascule structure. No plans yet adopted.

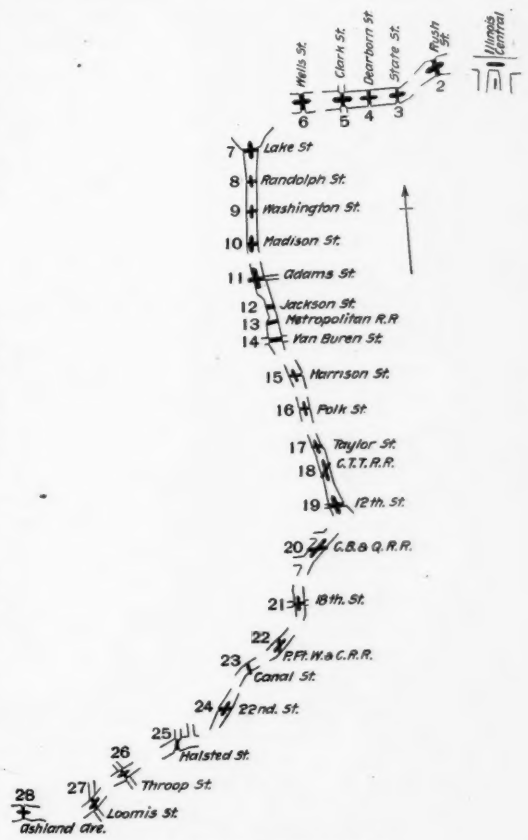
No. 20. St. Charles Air Line double track swing bridge. No plans have been formulated by the district for its removal.

No. 21. Eighteenth Street.—Swing bridge to be replaced by a Scherzer rolling lift bridge, now under contract for completion in 15 months.

No. 22. P., Ft. W. & C. Ry. double-track swing bridge. Rumor has it that the railroad company has plans for a four track structure to replace the one now in service.

No. 23. Canal Street.—Scherzer rolling lift bridge just put in commission, replacing the old Harmon Jackknife structure.

No. 24. Twenty-second Street.—A swing bridge in bad repair, will be replaced by a bascule structure in the near future.



Some Chicago River Bridges.

No. 25. Halsted Street Lift Bridge.—No plans now under advisement.

No. 26. Throop (or Main) Street.—A Scherzer rolling lift bridge has just been finished.

No. 27. Loomis Street.—A wooden swing bridge. For this site a Scherzer rolling lift bridge is now under contract for completion in 15 months.

No. 28. Ashland Avenue.—A Page (trunnion) bascule bridge has been substituted for the old swing bridge and it is now in service. The span of this bridge is 168 ft. between centers of piers. There is a bypass on each side giving a 38 ft. opening.

All of the bridges built by the Sanitary District provide for a clear waterway at right angles to the thread of the stream of 140 ft. between protections, with the exception of Taylor street, which only complies with the Government requirement of 120 ft. at right angles to the thread of the stream. This is also true of the Chicago Terminal Transfer Railroad bridge just below Taylor street.

Lincoln Power Station of the Boston Elevated Railway.

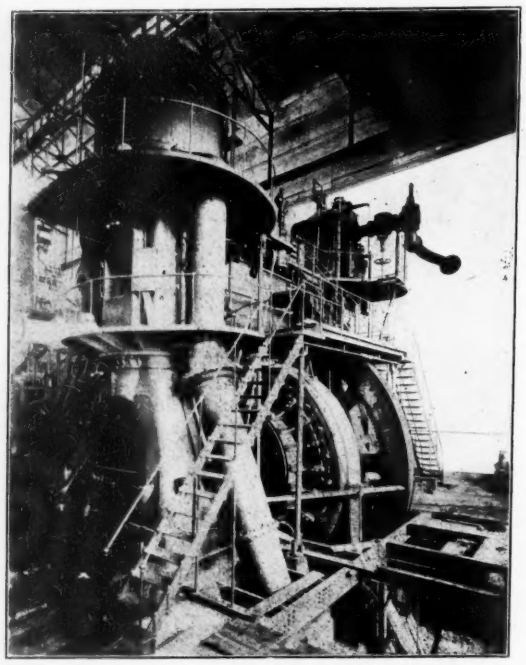
The Lincoln station of the Boston Elevated Railway is on the water front of Boston Harbor, with excellent facilities for the docking of coal and other supplies. The building is divided into two longitudinal sections, the boiler room and all apparatus pertaining thereto being in one section and the engines, generators and condensing system in the other. The engine room is served by a large electric crane of 40 tons capacity. The walls of this room are faced with white enamel brick.

The present station contains three units aggregating about 13,500 h.p. While it is now complete in itself, ample ground area has been provided for the extension of the building and plant on harmonious lines to accommodate four additional units, thus permitting an ultimate equipment of about 30,000 h.p.

Lincoln Power Station—Boston Elevated Railroad.

The boiler installation consists of eight 468 h.p. and four 490 h.p. Babcock & Wilcox boilers. An equipment of Roney mechanical stokers of the same type as those in the large power houses in New York City has been installed by Westinghouse, Church, Kerr & Co.

Coal is automatically unloaded from vessels and stored in a large pocket holding 5,000 tons, with a further storage bin of 3,000 tons in the boiler house, or a total storage capacity of 8,000 tons. It is carried to the boilers by a Hunt coal and ash conveying system which conducts the coal into overhead conveyors leading to the stokers. The plant is equipped with Green economizers.



Direct Connected Generator, 4,500 Horse-Power—Boston Elevated Railroad.

Feed water is supplied to the boilers by means of two vertical compound pumps made by the George F. Blake Manufacturing Co. A Star vacuum feed-water heater of 8,000 h.p. capacity is placed on the base of the chimney conveniently near the feed pumps. As the smoke flues from the boilers enter the stack at a point some 30 ft. from the boiler room floor, the space in the lower part of stack has been found quite valuable for the location of such auxiliaries as feed-water heaters, receiver of the Holly gravity return system and sundry piping.

The original engine installation consisted of two vertical cross-compound units of 4,500 h.p. each, built by the Providence Engineering Co. The generators and flywheels are carried on the shafts between the high pressure and low pressure sides. The generators are direct current machines, rated at 2,700 k.w. each. A third unit consists of a vertical cross-compound engine of about 4,500 h.p., designed and built by the Westinghouse Machine Co. and installed by Westinghouse, Church, Kerr & Co. It is of the same design as the one recently furnished for the Charlestown Power Station, and is direct connected to a Westinghouse direct-current generator of 2,700 k.w. capacity of the same make, and similar to one of the two machines mentioned above. The engine, however, differs considerably in design and construction from the two engines first installed. The high pressure cylinder is fitted with poppet valves for use with superheated steam, which is supplied by superheaters built by the Babcock & Wilcox Company.

Steam is conveyed from both sides of the boiler room by 8-in. mains to a 16-in. drum, from which it is conducted by 12-in. risers to Cochrane receiver separators and thence to the engines. All the live steam drips from steam drums, separators and reheating receivers are carried back to the boilers by the steam loop and Holly gravity return system.

First Aid To the Injured.

This was the subject before the meeting of the Railway Club of Pittsburgh on January 23. A paper was presented by Dr. J. D. Milligan, chief surgeon of the Pittsburgh & Lake Erie. His paper contains a copy of the circular headed "Aid to Memory," which is supplied to the employees of that road in connection with the emergency boxes which are kept on trains and in stations. We quote a portion of this circular. The portion not quoted deals with hemorrhage, fractured bones and other topics with which the reader is already familiar. The clauses quoted are especially commendable for their brevity and terseness, and the placing of them first on the list seems to be peculiarly appropriate.

Dr. Milligan said: On the Pittsburgh & Lake Erie, the institution of the first aid, has been in force for about two years. It is yet in its infancy, so far as thorough teaching is concerned, but we find when injury occurs that the unfortunate victim reaches the surgeon with greater safety to himself, and instead of finding him bloodless, we find the rubber tourniquet properly applied, an antiseptic pad over the wound, and a bandage over it to hold it in place; and should it be a broken limb, a temporary splint applied to keep the broken bones from doing additional injury, by goading the soft part to death from friction, while en route to place of destination. The marked improvement in the general condition of the injured on their arrival at the hospital has been such that it is now the exception to find a man so exsanguinated that he cannot at once be placed on the operating table; while previously, the reverse condition was the rule: to find his life ebbing slowly away, because no one seemed aware that hemorrhage could be safely controlled by a properly applied tourniquet. We feel safe in saying that by judicious first aid the death rate is much lower and the injured ones made more comfortable, and with these results obtained, we should be encouraged to a more vigorous and thorough effort to secure the most efficient detail and co-operation that can be afforded.

Our First Aid or Emergency Box contains bandages, assorted sizes; sublimated gauze, rubber tourniquet, cotton, safety pins and enough to care for two or three injured persons. Our folding stretcher contains two blankets and one rubber blanket, and four splints, assorted. Each caboose and each baggage car has a set of these supplies—each station and telegraph office is similarly supplied. A small handbook has been issued to the men, and a circular has been placed in the hands of the men, entitled

AID TO MEMORY.

First Aid Package.—For small wounds on any part of the body.

Gauze.—For large wounds.

Cotton.—To cover over on top of the gauze.

Rubber Band (Tourniquet).—To fasten around a limb or around the head to stop hemorrhage, particularly in case of crushed limb.

Adhesive Plaster.—To hold dressings, but never to be applied to an open wound.

Cotton Bandages.—To be used over first dressings where there is much bleeding.

Gauze Bandages.—To fasten splints in place and to support light dressings where there is no hemorrhage.

Safety Pins.—To fasten bandages, etc.

First—Don't give a drink of whiskey.

Second—Don't pour ice or very cold water on wounds.

Third—The patient should be placed on his back, with head low, and this position should be continued in transporting.

Fourth—If the person is suffering from "shock," that is, pale with pinched expression of face, drooping eyelids and cold surface of body, with feeble pulse, give spoonfuls of hot tea or coffee; if this cannot be had, teaspoonful of whiskey or some other alcoholic stimulant, in a tablespoonful of hot water every 10 minutes until five or six doses have been taken. Wrap in a warm blanket and put hot water bottles or heated bricks about the body.

Fifth. Remove the clothing from the wounded part by cutting it away. Do not attempt to tear or draw clothing off, as this may further injure the wounded part. Always see the wound and know by your eye just what the nature of it is.

Sixth—If a limb is crushed or torn apply over the wound a thick pad gauze, then a large covering or pad of cotton, fastened with several turns of the bandages, handkerchief or an elastic suspender.

Seventh—Hemorrhage.—This follows shock and is very rarely severe unless reaction takes place. Too much stimulation increases hemorrhage and for this reason it is best to give only a little stimulant, well warmed, and repeat the dose if reaction is delayed.

Observation Motor Car—Canadian Pacific Railway.

The Canadian Pacific Railway Company has built at its car shops in Montreal a gasoline motor observation car for the use of guests at the hotels in the Rocky and Selkirk Mountains. The car will be located at Laggan, the station for the "Lake in the Clouds," and will traverse the line from Banff to Lake Louise, across the divide to Field, or even to the great glacier of the Selkirks.

In appearance it resembles the ordinary open street car, being 13 ft. 6 in. long over body, and 20 ft. long over all. The underframe is of steel, and to it is attached a 10 h.p. gasoline engine equipped with an electric ignition appliance. The car can make 30 miles an hour on a level and can climb any of the mountain grades, or haul a trailer. The gasoline tank holds 20 gals., which is sufficient for a run of 300 miles. The whole is mounted on a four-wheel truck with steel tired wheels 25½ in. in diameter. The movement of the car is controlled by three brakes, an emergency and two hand-brakes.

Gasoline Driven Observation Car—Canadian Pacific.

The superstructure is very light, open at the sides, giving a free view of the highest peaks on either side of the track. Canvas screens, fitted to rollers, can be adjusted in a few seconds to make a waterproof roof, and blinds of similar kind enclose the sides. The front is fitted with plate glass. Spring seats, upholstered in leather with reversible backs, provide accommodation for 14 passengers.

Acetylene Car Lighting.

THE ADLAKE SYSTEM.*

Acetylene gas, especially when diffused by means of an opal globe, is the nearest approach to the ideal (daylight) that the ingenuity of man has yet devised. Brilliant, yet pure, it adapts itself to this type of globe, which, while somewhat reducing the candle power on direct lines, illuminates all parts of the apartment with substantial uniformity. No other gas yields a sufficiently strong light to permit the use of such a globe. The yellow-burning gases are almost invariably provided with globes of clear glass with reflectors, and of necessity the light is thrown down, leaving the deck of a coach in shadow and gloom. Compared with electricity, acetylene gas has the added advantage of uniformity of illumination, there being no variation in the intensity of the light, and economy. It is not only of the highest efficiency for train lighting, but it is the cheapest of the modern illuminants.

In the Adlake system, the water-to-carbide system of generation is utilized, its seeming unsurmountable difficulties having been entirely overcome. The carbide is segregated into small masses which are acted upon in succession. A limited quantity of water is used, controlled wholly without the use of movable mechanical parts. The gas, generated at a temperature of about 200 deg. F., is led through a condensing coil, which drains back into the generator, then through a scrubber to a storage tank having a capacity of 6 cu. ft. From this tank the gas is distributed through the car, a suitable pressure regulator being employed.

The water feed is cut off by a gas pressure of 1 lb. and the machine blows off at 13 lbs., this pressure being occasionally reached by reason of "after generation." The machine produces gas therefore only at the rate of consumption, whether but a single burner or the full comple-

*Abstract of a paper presented by L. K. Gillson, representing the Adams & Westlake Co., at the New England Railroad Club, Jan. 13. For an illustrated description of the system see *Railroad Gazette*, Nov. 22, 1901, page 802.

ment be lighted, the production of gas varying automatically.

The generating tanks or cartridges are charged with carbide away from the car and brought to it hermetically sealed. As now made, these generator tanks are of such size that the machine requires attention only at terminal stations. They are attached to the piping system of the car by locking mechanism co-operating with the valves in such a manner that the latter cannot be opened until the tank connection is properly made, and this connection cannot be broken while the valves are open.

The problem of preventing the development of a detrimental temperature in the water-to-carbide system of generation was solved by the segregation of the carbide into small masses, and by preventing, by the form of the receptacles and the manner of feeding the water, the access of vapor to the carbide. By this means the generation proceeds slowly but continuously, and is accomplished by the action of water in liquid form only, so that there is but little chemical action at any time, and hence but little heat, while the transformation of the water from liquid to vapor stores away the heat in latent form as it is developed. The result is a full yield of gas of excellent quality.

Any system in which water vapor obtains access to the carbide is uneconomical for the double reason that the carbide is roasted and will not decompose, while the gas is heated to a temperature which causes it to change its form to a substance resembling tar. The existence of undue heat is indicated by the yellow or "roasted flour" appearance of the residuum, and the pipes and burner tips become clogged. This impracticable temperature is always present when the water is fed to the bottom of the mass of carbide, the gas escaping up through the carbide. The added disadvantage of prolonged after-generation is present in this style of generator, because the sludge remains in contact with the undecomposed carbide and its moisture is drawn up through it until the mass is completely dry.

Further trouble arises in the use of the bottom feed from the solidification of the lime resulting from the disintegration of the carbide and through which the water must pass to reach the active carbide. The jarring of the train causes this lime to become impacted so that the water will pass through it but slowly and as a result the supply of gas is reduced. If the use of the light is stopped for a time and this solid mass of lime becomes dry, action cannot be recommenced until the water has had time to soak through it.

In the Adlake generator all of these troubles are avoided by delivering the water on top of the uppermost of a number of bowls. After it has completely saturated the contents of this bowl it overflows to the next and so on until they are all filled with water.

To avoid waste of gas a small storage tank, having a capacity of 6 cu. ft., is provided, to take care of the "after generation"; that is, the gas generated after consumption ceases by the action of the water which chances to be then present in one of the bowls or receptacles.

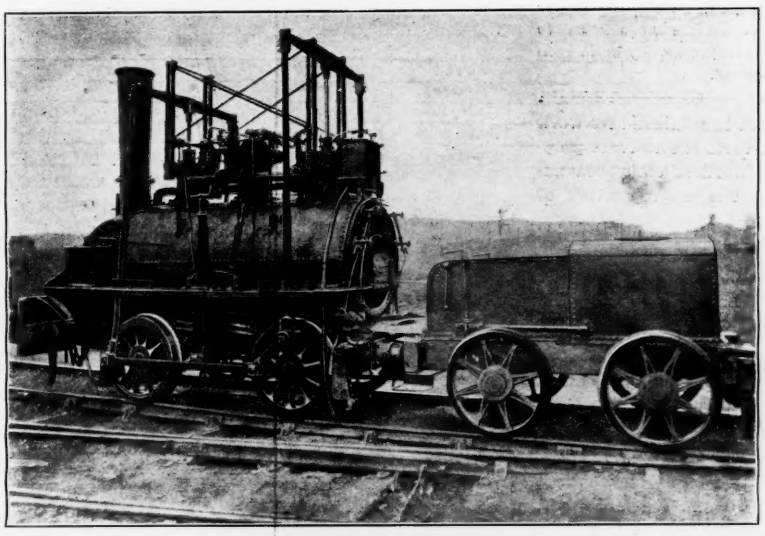
Acetylene gas, unlike others, burns best when not previously heated, and the Adlake lamps are so made that they bring it to the tip at a low temperature. A further advantage in the lamps employed is that they discharge their vapors entirely outside the car, thus carrying off most of the heat developed.

Calcium carbide will always yield acetylene gas when water is applied to it. Any system is reliable, therefore, which provides for constant supplies of carbide and of water, and means for bringing them together at such rate that gas is generated in the volume required. The problem has been to devise such a generator for car service. The Adlake generator tanks are filled with carbide at any suitable point along the line. The initial charge in the generator tank is sufficient to light the car between terminals. Under no circumstances does it become necessary to switch a car to any particular point for charging. There is, therefore, no reason why cars equipped with the Adlake generator should at any time be without light. The car equipment is extremely simple. There are no movable parts to get out of order, and nothing except a failure of supply of water or carbide can check a constant generation of gas save a suspension of its use. The removal of an empty generator tank and the installing of a charged one is effected without interfering with the continuous illumination of the car. Such change, however, while en route becomes necessary only in case of emergency.

In developing the Adlake acetylene system it was recognized that the most potent elements of danger in the use of gas are (1) a large volume of inflammable gas; (2) uncertainty of control of the generator; and (3) the effect of a train wreck upon the lighting system. The presence of a large volume of gas is especially disadvantageous in case of a wreck of the car. The liberation of the entire supply is always to be apprehended in case of a train accident. If the volume be large the resultant damage is apt to be correspondingly large. It is, however, important that when the gas is generated on the car sufficient storage be provided to compensate for any possible variations in the generating action. To this end there is employed in the Adlake system a storage tank having a capacity of 6 cu. ft., within which may be held all the gas produced in "after-generation." The gas supply, never exceeding a pressure of 13 lbs., is so small that it would be very quickly dissipated in the event of the rupture of the tank. It is so small, indeed, that if by any chance it were to be discharged into the interior of the car itself it would not form, with the air therein contained, an explosive mixture.

The feeding of carbide can be accomplished only by a movable mechanism which must be self-regulating. Generators have been proposed for car service in which the carbide feed is controlled by a slide valve operated by a spring and diaphragm, a given pressure of gas acting upon the diaphragm to compress the spring and close the valve. The carbide is in granular form and sooner or later small particles will enter the ways of the valve and retard its movement. Theoretically, in such a machine the valve will have very little play, opening upon a slight drop in pressure sufficiently to discharge a small quantity of carbide, which instantly restores the pressure and closes the valve. An increase in the friction of the valve will necessitate a greater drop in pressure before the spring can act, with the probability that when the valve begins to move it will be thrown wide open, permitting the feed of a large quantity of carbide, thus causing an instantaneous development of a very excessive pressure. Under such circumstances there is a strong probability either that the generator will be ruptured or there will be a violent blowing off which will carry out with the gas a quantity of the white sludge to be spattered over the exterior of the car. This proved to be a common experience with the generators of this type which were put into service. Another fruitful source of irregularity in this kind of machine is the choking of the feed by the slaking of carbide within the container, due to the action of water vapor finding its way into the same.

These difficulties having been foreseen, and with a view to reducing the size of the device, the water-feed system was adopted in the Adlake machine. All the mechanical movable parts are eliminated and the water feed is positively and certainly controlled by the direct pressure of the gas upon a rising column of the liquid. There can be absolutely no feed of the water when a pressure of



The Oldest Working Locomotive.

1 lb. exists, and the water feed is invariably resumed when the pressure falls below this limit. By reason of the sub-division of the charge of carbide and the delivery of water to the containing bowls in succession, and by the overflow of each to the next, the quantity of water present at any time is insufficient to carry the pressure beyond 13 lbs., and the blow-off limit is in fact rarely passed.

In case of wreck, it is obvious that the danger arising from the lighting apparatus should be minimized. It is believed that this has been accomplished by reducing the volume of stored gas to a very small quantity; by keeping the pressure exceedingly low (on the average about 3 lbs.) by separating the water and carbide so that in no event can there be a quick flooding of the generator; and by locating the water tank above the generator so that in the event of overturning of the car, the water feed is instantly cut off by gravity, and the generation of gas stopped.

THE STORAGE SYSTEM OF ACETYLENE CAR LIGHTING.*

Briefly described, the system of the Commercial Acetylene Co. consists of a steel tank or cylinder of proper size, packed from end to end with porous brick or asbestos disks, which, without going into details, have the properties of eliminating all danger from explosions. Before charging with acetylene, acetone, equal to about four-tenths of the cubic capacity of the tank is pumped into it, all of which is absorbed by the asbestos or porous brick. A remarkable instance of absorption of a gas in a liquid is the absorption of acetylene in acetone. Acetone is a mobile colorless liquid, which is obtained by the destructive distillation of wood, and by the condensation of gases and products of incomplete combustion from wood distilleries producing charcoal. It is closer akin to alcohol than to any other ordinary substance. It burns, if lighted with a match, but unlike alcohol, gives a smoky, yellow, non-luminous flame. Acetone is used in the arts to a limited extent as a solvent for paints, dyes, etc. Its most important property is its ability to absorb acetylene, which property varies directly and enormously with the pressure under which the acetylene is applied. Acetone at atmospheric pressure and ordinary temperature will absorb 15 times its volume of acetylene. That is, 1 cu. ft. of acetone will absorb 15 cu. ft. of acetylene, and its power of absorption increases at the rate of one volume of acetylene for each volume of acetone for each pound increase in pressure. A further property is that the acetone will give us its acetylene upon the removal of the pressure, or will give up any part of its acetylene which it has absorbed in direct proportion to the amount of pressure removed. That is to say, if it has absorbed 100 volumes of acetylene under 100 lbs. pressure, it will give up 5 per cent. of the acetylene upon the reduction of the pressure from 100 lbs. to 95 lbs., and so on until all the pressure has been removed, when all the acetylene will have been set free.

The importance of this discovery will be apparent when it is seen how enormously the containing power for acetyiene of any given container can be increased by first filling the container with acetone and then introducing the acetylene under pressure. This is especially valuable for storing acetylene, or for transporting it, as in railroad lighting, etc.

The extent to which the holding capacity of a container is increased, as reckoned in candle power hours, will be better understood from the following: A receiver 3 ft. in diameter and 2 ft. high has 14 cu. ft. capacity. This would hold enough ordinary 20-c.p. city gas to supply a 5-ft. burner for a little less than three hours, or about enough for one evening. If the city gas was compressed to 150 lbs. pressure, which is the limit for ordinary city gas, the contents of the holder would supply a 20-c.p. light for ten evenings. If the same holder were filled with acetylene gas at atmospheric pressure, it would supply a 20-c.p. light for ten evenings; if compressed to 150 lbs., for 100 evenings; and if to 600 lbs., for 400 evenings, or for more than 14 months. If, however, the receiver was first filled with acetone, and the acetylene introduced at 150 lbs. pressure, there would be enough acetylene to supply a 20 c.p. light for 4 years, 3 months and 4 days; while if the acetylene were put in at 600 lbs. pressure, the holder, which when filled with ordinary city gas at atmospheric pressure would supply a 20 c.p. light for only one evening of about three hours, would supply the same amount of light for the same number of hours for 16 years, 5 months and 10 days.

It will be seen that 3,500 cu. ft. of acetylene gas at 240 lbs. pressure can be put in a cylinder 10 ft. long by 20 in. in diameter, whose cubic capacity is but 22 cu. ft. In other words, under the Commercial Acetylene Company's system, the tank just described will contain sufficient acetylene gas to properly light a Pullman car for seven round trips from Chicago to San Francisco without recharging.

Related to this simple car equipment for this system is an equally inexpensive generating plant. This you will agree, in order to produce acetylene at a minimum cost, is necessary, and should be erected at some central point; or upon a large railroad system with branch lines extending in different directions, two, or even three or four such plants may be necessary. To be brief, without going into details, such a plant including generator, gas holder, compressor, and proper motor power exclusive of building, can be erected complete, everything first-class and substantial, for from $3,500 to $5,000, according to the capacity of the gas holder.

This same plant or plants can be utilized, if desired, to furnish gas for lighting local shops, offices, stations, freight houses, etc., and for charging cylinders to be transported to cars and stations along the line. One man of ordinary intelligence and one good strong helper will be all the labor necessary to operate such a plant.

*Abstract of a paper presented to the New England Railroad Club, Jan. 13, 1903, by Mr. E. G. Fisher, Mgr. Acetylene Gas Department of the Pyle-National Electric Headlight Co., Chicago.

An Early English Locomotive.

We reproduce herewith an illustration that appeared in a recent issue of the London *Engineer*, of what is said to be the oldest working locomotive in the world. It is one of the original locomotives built by George Stephenson for the Hetton Railway in 1822 and has been in service hauling coal trucks over that road, for nearly 80 years. The Hetton Railway was the longest railroad which had, up to that time, been built in the north of England. It was eight miles long and extended from Hetton colliery to the river Wear.

The engine has, of course, undergone many repairs during its long service, but the general design, with few exceptions, remains the same as originally built. Some of the principal dimensions are: Diameter of cylinders, 10¾ in.; stroke, 24 in.; diameter of wheels, 36 in. The engine weighs about 15 tons and is capable of hauling a load of 120 tons over a level track at a maximum speed of 10 miles an hour.

The locomotive is soon to be taken out of service and will be presented to the Durham College of Science, Newcastle-on-Tyne, and preserved in their museum.

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

It is understood that Congress has finished its work for the present session on the various anti-trust propositions, and the sum of this work is embraced under four heads, namely: (1) An appropriation of $500,000 to enable the Attorney-General to prosecute suits against violators of the Sherman anti-trust law and other acts regulating interstate commerce; (2) a bill to give preference in the Federal Courts to suits of this nature; (3) the Elkins bill, amending the interstate commerce law. This bill abolishes imprisonment as a penalty for rate-cutting, makes the corporation equally guilty with its officers or agents where illegal rates are given, makes the shipper equally guilty with the carrier, and increases the maximum penalty from $5,000 to $20,000; (4) the establishment of a Bureau of Corporations, to be a part of the new Department of commerce and labor, which shall have power to investigate corporations (except railroads) engaged in interstate or foreign commerce. The Littlefield bill, originating in the House and unanimously passed by that body, and which would have required minute annual reports from mercantile and manufacturing corporations, seems to have been dropped; and all such radical propositions as that forbidding the interstate transportation of goods offered for shipment by offending corporations, have failed. The Elkins law and that establishing the new Bureau are given on another page. It is quite possible that the simple provisions of the first and second acts will prove to be the most immediately useful of the lot, for these affect cases which are now pending and which may, when decided, settle important points of law. Of the many abortive attempts which the Interstate Commerce Commission has made during the past ten years to detect and punish secret and illegal rate-cutting, apparently some might have succeeded if the Government had put more energy into the prosecution. With a large appropriation this additional energy should now be available.

The Elkins bill really makes only one radical change in the law; it abolishes imprisonment. But it increases the maximum money penalty from $5,000 to $20,000, which is a good change; and of course it is expected that convictions will be made easier in consequence of the general feeling that where an agent has broken the law at the command or wish of his employer, the company will pay whatever fine may be imposed on him. But the clauses defining rate-cutting and prescribing the fines therefor only re-enact in a little more explicit language, penalties which already exist. Section 10 of the Act to regulate commerce says that "any common carrier . . . or any . . . officer thereof . . . who . . . shall wilfully do . . . any thing in this act declared to be unlawful . . . shall be deemed guilty of a misdemeanor and shall . . . be subject to a fine of . . . $5,000." Except on the technicality that the use of the pronoun "who" excludes artificial persons and therefore nullifies the first three words which we have quoted, no one can say that this language does not clearly apply to railroad companies. The common assertion that the shipper is now for the first time made subject to the law is also largely fallacious, for the third paragraph of the same section (10) says that "any person . . . who shall deliver property for transportation . . . or for whom . . . carrier shall transport property . . . who shall knowingly and wilfully . . . by any means . . . obtain transportation . . . at less than the regular rates" shall be deemed guilty of fraud, etc. If the shipper is a person, the law applies to him already. Surely it cannot be that all of the receivers of illegal concessions during the last dozen years have been corporations. However, these are now matters of the past, and all that will be asked of the Commissioners by the public will be that they go ahead and catch every law-breaking rate-cutter in the country. Strength to their elbows!

If this law, with the $500,000 appropriation, had been passed five years ago, it might have enabled the Interstate Commerce Commission to expose a good deal of pernicious rate-cutting; but the situation now is entirely different. The principal roads have not only ceased paying secret rebates, but are voluntarily telling of the fact, in their answers to the inquiry of the Interstate Commerce Commission as to why freight rates have been raised; and incidentally some of them are giving the affirmative information that they did pay rebates previous to a certain date now past. The "community of ownership" in many important roads has partly removed the incentive to excessive competition, and the glut of freight nearly everywhere has in many cases renderd real competition almost or quite impossible. It is true that some traffic managers are inclined to cut rates when they already have enough goods to fill their cars, and that in some cases two roads practically controlled by the same man bid against each other; and therefore we cannot tell on how solid a foundation the present good condition rests. When dull times return, competition may again become reckless or even lawless. But the law is not merely an instrument for punishment; it is a deterrent; and we may hope that with its advent, and with the good influence of "community of interest"—even among those who as yet have not thus made peace with their competitors, but who see its good effects—the more vicious forms of rate-cutting will never return. In the meantime the Interstate Commerce Commission will be able—if it can convince the Attorney-General that he ought thus to spend a part of his half million appropriation—to make an example of any railroad or shipper that is detected breaking the law.

Center Plates and Side Bearings.

On another page appears a communication from Mr. John Kirby commenting on an article in our issue of February 6, by Mr. H. M. Perry, on center plates and side bearings. Mr. Kirby's letter is of interest as coming from one of the oldest and most respected of the pioneer car builders in this country. What he says is based on the experience of a lifetime, and, for the most part, his views coincide with the opinions of those who have experimented with anti-friction side bearings and center plates in actual service. No one will question the assertion that elimination of resistance to swiveling of the truck will prevent to a great extent sharp flanges. The question at issue is, What is the most efficient and satisfactory method of doing away with the excessive friction between body and truck of the modern freight car? Frictionless side bearings have proved satisfactory under passenger equipment, but the conditions to be met with in freight service are much more severe, and opinion is divided as to their value under the high capacity freight car of to-day.

Primarily, the function of the body bolster is to transmit the weight of the car from the longitudinal sills to the truck. The purpose of the side bearings should not be to relieve the bolster of any load, the logical point of support of a member so loaded being at the center where unequal distribution of the stresses cannot occur. Bolsters stiff enough and strong enough to carry the entire load at the center are just as essential as sills strong enough to carry the weight imposed. Any attempt to put the load, or a part of the load, on the side bearings under normal conditions of straight track is sure to result in unequal and excessive pressures, which will prove destructive to bolster and truck alike. Only when rounding curves has the side bearing any real function. The elevation of the outer rail tends to raise that side of the truck and centrifugal force tends to tip the car body over to the outer side. Under these conditions the side bearing is a necessity. Some support must be given the outer edge of the car body to prevent dangerous tilting. A similar condition must be met at times on straight track, when the car rocks in passing over rough spots, frogs and crossings, and to prevent a severe hammer blow in either case the smallest possible clearance must be allowed. This is not to be confused with supporting any weight on the side bearings when the car is at rest. The function of the side bearing is to act as a stop to the motion of the car body, not as a support for its weight. When rounding curves, however, the resultant of the weight of the car and the centrifugal force must be carried in part on the side bearings. At the same time, the swiveling of the truck must be provided for. The need of some anti-friction device to reduce the friction between the body and truck bearing passing over each other under these conditions can readily be appreciated. The truck is bound to assume a position tangent to the track, and the center line of the car becomes a chord of the circumference of the curve. If the resistance to this change of relative position between car body and truck is great, the flange of the wheel will grind against the inner face of the rail.

Mr. Kirby suggests a form of side bearing consisting of two chilled conical rollers of large diameter; many other forms have been tried with complete, or partial, success. The greatest difficulty seems to be in making a bearing that will not crush, develop flat rollers or cut and abrade the surface of the top plate. The pressures are excessive for the bearing surface exposed, the alignment of the top and bottom bearing is difficult to maintain, and the dirt and grit act as excellent agents to destroy the hardened surfaces. These are, perhaps, a few reasons why the anti-friction bearing has not met with a complete success. The results obtained under favorable conditions have been so satisfactory, however, as to leave no doubt as to their value in reducing excessive flange wear. In 1902 a committee of the Master Car Builders' Association made a report on center plates and side bearings, which gave the results of a number of tests and comments from railroads using various forms of anti-friction bearings. The report contained no recommendations as to the best form of center plates or the area of rubbing surface, but the tests for best material support Mr. Kirby's objection to a steel plate. The size of the plate in no way affects the friction developed, since the coefficient of friction and the total pressure are the only two factors to be considered, but the shape of the plate has much to do with obtaining satisfactory results. The value of lubrication was well brought out in these tests, and Mr. Kirby's suggestion that the upper plate cover the lower plate seems to be timely, as such a construction would keep out dirt and reduce the friction between the two surfaces. Any form of anti-friction device which can stand up under the service required is quite as valuable in the center plate as in the side bearing; in fact, more so, since there is no tendency for the truck to resume its normal condition on leaving a curve except the excess of pressure on one flange. If the resistance to straightening out is too great to be overcome by this force the flange may go on grinding against the rail mile after mile after the curve is passed.

The benefits derived from anti-friction side bearings and center plates may be accurately determined by the reduction in flange wear on the wheels, but the results are more far reaching than even this. Reduction of flange wear means reduction in rail wear, less train resistance and consequent reduced cost of transportation. Excessive and destructive stresses in trucks and car body are eliminated and their life prolonged. The side bearing is a necessary evil. All that can be done is to devise some form which will withstand the severe service to which it is put under heavy capacity cars and which, at the same time, will eliminate the friction between the truck and the car body.

Block Signals and Flagging Back.

The Westfield collision on January 27 suggests again the inadequacy of protecting a stopped train by red signals or torpedoes carried back by a rear-brakeman. Probably not a new word can be said on this often-discussed subject, but the fact that reliable block signals of demonstrated efficiency are now easily available makes a reconsideration of this old topic a timely one. The significant facts at Westfield are that the rear-brakeman of the stalled train did not go back far enough to afford protection, and that the engineman of the express was really relying on his time interval and was not closely watching for signals. If he had been running on his signals he would surely have reduced speed and put his train

under control at the distant signal whether or not it was visible. He knew that at starting there was a time interval, and it is plain that he was relying on that interval and probably on a torpedo brought back and placed by the rear-brakeman if the preceding train lost time. The question may therefore be whether or not the rear-brakeman rule is not an added danger instead of a provision for safety.

On a long tangent the brakeman, knowing that he will see the next train long before it can reach him, naturally goes back but a short distance. He does not want to get left. It seems justifiable under the rule which directs him to go back a sufficient distance to protect his train. The provision directing the use of torpedoes "when the conditions require it" would be held to be inapplicable, because the conditions require an audible signal only when the efficiency of the visual signal is impaired or is in doubt. In clear weather on a level straight line visual signals are at their best. An extreme view would be that, to provide against neglect of the engineman or possible temporary obscuration of the flag or light, the torpedoes should be used on tangents just as invariably as they would be used on curves; in clear weather the same as in a blinding snow storm; but nobody puts this view into practice.

But without further discussion of inefficient flagging, what measure of real protection, let us ask, is secured if the flag and torpedo are used with reasonable faithfulness? An audible signal has no effect on the engineman until he reaches it, so it must be given as far back as will be necessary to afford the required distance to stop the train. At 60 miles an hour on level track, with emergency application, perhaps 1,600 ft.; and at 70 miles an hour over 2,000 ft. These speeds are not unusual. On ascending grades the necessary distance is less, but on descending grades it is greater. Of course, no flagman should depend on the engineman to surely stop in these distances; prudence demands that they be lengthened to 2,600 ft. or more. For heavy freight trains with few or no air-brakes a half mile may often be insufficient. If torpedoes are to be relied on in any degree, these distances must be provided for; that is all. We are not now arguing for or against the flagging system; only insisting that if the system is to be recognized at all, it is essential to prescribe adequate distances.

The torpedo clause is and always has been the most uncertain feature of Rule 99. When a brakeman is called in before he has gone the whole of the regulation distance he puts down torpedoes, if he uses them at all, at the spot where he finds himself when he hears the recalling whistle; but, as that may be anywhere from two to ten telegraph poles, the explosion may be anywhere from two to 30 seconds too late. The only rational rule would require the brakeman to go the whole distance even if the whistle sounded before he had gone a half minute. Some rule-books used to contain the admonition to conductors and brakemen that while the brakeman (flagman) was coming in was the most dangerous time of all; that short period of time is particularly dangerous because the visual warning has been partly withdrawn and the audible one, very likely, has not been fully provided. It is impossible to eradicate the notion that the visual signal alone is enough, and that the audible signal is a mere auxiliary; and it is always hard to make men pay as careful attention to the auxiliary as to the primary means. As soon as we admit that every stop requires the flagman to go back; that every time he goes back he must use torpedoes; and that torpedoes must always be placed where they will be effective—that is, at least half a mile, we admit the impracticability of the flagging system. A train may stop every mile for five miles, as occurs frequently on busy lines approaching crowded city terminals; and this demands the employment of five flagmen on each train, unless in each case the train is to wait until the man goes out and puts down the torpedoes and comes back again, an intolerable delay. If the train does not wait for him he flags the next train to take him on, a stop which otherwise would usually be unnecessary. If trains are numerous enough we may easily find that this second train must then send back its own flagman, and so on, until the system breaks down. The practical difficulty, from the superintendent's standpoint, is the impossibility of laying down any workable rule by which the conductor or the brakeman, or either of them, can readily decide when it is and when it is not proper to relax these crude safeguards. This brings us back to the old difficulty of leaving the trainmen to use their own judgment.

Remembering that we are considering now, not the whole question of the safety of railroading, but only the one point of flagging to prevent rear collisions, it would seem quite pertinent to ask whether we had not better adopt the English practice of depending entirely on the block system and dispense with the flagman. A Board of Trade Inspector explained, on one occasion, where he uttered no censure on a rear guard who neglected to protect his train against a rear collision, that he had remained silent on that point because he deemed it impracticable to carry out the flagging rule. Is it not believable that Davis, the engineer at Westfield, would have been much more careful of his fixed signals if he had not known that the brakeman was required to warn him with torpedoes?

There is now little doubt that the plan for changing the lines of the New York Central within the city of New York so as to eliminate all grade crossings and the use of steam locomotives below the Harlem River will be executed. The track plans will be substantially as shown in these columns January 2. The operation of such a terminal by electricity is, in magnitude, without any precedent and quite justifies the appointment of a special commission of experts to plan for it. This Commission is composed as follows: W. J. Wilgus, Fifth Vice-President, and A. M. Waitt, Superintendent of Motive Power, together with the electrical experts, Messrs. Bion J. Arnold, Frank J. Sprague and George Gibbs. Of these Mr. Arnold is a consulting engineer and member of the American Institute of Electrical Engineers. He has made a series of studies on the application of electricity to heavy railroad work, and was commissioned by the New York Central, in August, 1901, to report on the feasibility of working trains by electricity between Mott Haven Junction and Grand Central Station, New York. Mr. Sprague, consulting engineer with the Sprague Electric Co., and President of the American Institute of Electrical Engineers in 1892-3, is the originator of the multiple-unit system of control which bears his name, and which is in use on the Manhattan Elevated in New York, and the South Side Elevated, in Chicago, and is an accepted method of control for similar services. Mr. Gibbs, Vice-President of Westinghouse, Church, Kerr & Co., and member of the American Society of Civil Engineers, is consulting engineer for the Rapid Transit Subway, and the Atlantic Avenue improvements of the Long Island Railroad, and is a member of the committee employed by the Pennsylvania Railroad to make studies for the East River tunnel.

The per diem car service rule has cost the New York, New Haven & Hartford $175,000; that is to say, President Hall reports that car-service balances since July 1, 1902, have been $175,000 more than the corresponding charge for the same period of the previous year under the mileage plan. Every effort, he says, has been made to get cars promptly unloaded by consignees, often successfully, but in other cases consignees in Connecticut have insisted on availing themselves of the statute allowing four days' detention. The members of the American Railway Association who forced the general adoption of the per diem plan, against the protest of the New Haven road will read this announcement with peculiar interest: and there are some who will say that they should read it with sympathetic sorrow. We fully appreciate this view, and have no doubt about the sympathy; but nevertheless feel warranted in tendering congratulations. The road is to be congratulated on its courage, and the American Railway Association is to be congratulated on the fact that, though a purely advisory body, its influence is now so much spoken of as a powerful factor in the business world. The $175,000 has been spent in a good cause. It is fair to conclude that freight car reform in New England has been and is being stimulated in a marked degree; and it is to be hoped that the four-day Connecticut detention law may be ultimately repealed. Moreover, in sympathizing with the New Haven people it must not be forgotten that the lenders of these cars not only hold that the $175,000 represents payments for which full value was given, but insist that the same is true even when the division of the transportation charge is taken into consideration.

Reporters, innocent investors and others who accept and ask others to accept glowing schemes for making money by hauling heavy freight cars over country wagon roads will be interested in the report, from Toledo, that the Lake Shore Electric railroad, running along Lake Erie from Cleveland to Toledo and Detroit, is to discontinue its freight business. At present, a certain amount of bulky freight is carried, on the Toledo, Fremont & Norwalk branch, but the business does not prove profitable, and the freight cars obstruct the passenger traffic. The express business, which includes produce and market trade, is increasing rapidly, and will be energetically cultivated. The competition of the lake boats and of the steam railroads, appears to have been too severe to leave any profit on through hauls of heavy and bulky freight between Cleveland and Toledo.

The Deputy Minister of Railways and Canals reports that 574 miles of railroad were laid, in Canada, during the year ending June 30, 1902, as against 658 miles for the year previous. The *Railroad Gazette* estimated from returns from practically all of the active companies that 342 miles were built in Canada during the year ending Dec. 31, 1902, but the figures are not mutually corrective, primarily because of the difference in the fiscal year, and also because it is not definitely stated that the government returns are in all cases exclusive of second track and sidings. It is probable that the figures furnished by the Deputy Minister are less restricted in their scope. The total mileage in Canada on June 30, 1902, was reported to be 18,868 miles.

NEW PUBLICATIONS.

The Thermodynamics of Heat Engines. First edition. By Sidney A. Reeve, Professor of Steam Engineering, Worcester Polytechnic Institute. New York: The Macmillan Company, 66 Fifth avenue. 304 pages 5 x 7½ in., appendix. 1903. Price, $2.60.

This book treats an old subject in a decidedly new way. The author has omitted a preface, but if we were asked to supply one we should say that it is a book admirably adapted to first teaching, and that it is likewise of value to one who has studied this same subject from other texts. The author has approached the various problems involved from the standpoint of entropy and temperature. We have no doubt that the original conception of thermodynamics from that point of view is more difficult than the usual method, but when the idea has once been grasped the principles involved become easier and more firmly fixed in the mind.

The author has a picturesque and somewhat fascinating style, and the title of the book might more properly be called "The Story of the Thermodynamics of Heat Engines." To illustrate this we abstract the following from the first chapter of the book: "The vigor of the storm, the irresistible motion of the glacier, the erosion of the mountains and the filling of valley or lake; the frosted window-pane, the sculptured iceberg, the mirage of the desert, the singing bullet, and the quiet beneficent storage of water in pond and reservoir; the gun, the rocket, the steam engine and the gas engine—all are manifestations of heat and its transformations into motion, all are more or less thermodynamic in character." The development of the general principles of energetics (as the author terms the usual laws of energy) is carried out along the same general lines, making a readable and entertaining chapter, and by all means instructive and lasting.

We shall not attempt to pick out all the good things which this book contains, but shall give a few of the more important topics in the order in which they are taken up.

Chapter 2 is headed "The Cycle," which the author defines as a series of processes, usually four in number, by the repetition of which a finite amount of matter may effect a continuous or infinte conversion of energy from one form to another. The conception of entropy and temperature has been developed by using the analogy between height and weight. In the latter case, energy is the result of a given weight moving through a given height, and similarly heat energy is the result of a given quantity of entropy descending through a certain temperature range. The author objects, however, to the usual assumption that entropy is a mere mathematical ratio, heat divided by temperature. He states that thermal energy is normally distributed evenly throughout the body containing it, which means that there is a variable portion of the mass of each atom entering into the motion which constitutes thermal energy, and that this variable portion is the entropy of the body, or, or in other words, entropy is thermal mass. The remainder of this chapter is devoted to a graphical analysis of the several factors entering into a closed heat process. The final deductions are shown to be analogous to the admission of water at the head race level in a mill wheel and being distributed at the tail race level—the most efficient process being that in which no water is allowed to leak from the upper to the lower level. This analogy is applied to the use of re-heating coils which have lately been the subject of considerable discussion. He shows that thermodynamically the addition of heat midway between the upper and lower limits of temperature is inefficient, but that in this particular case other losses are diminished and hence the ultimate advantage of re-heating coils remains an open question.

Chapter 3 deals with the "Thermal Properties of Matter," and the chapter closes with a number of problems in the use of the steam tables.

Chapter 4 is entitled "The Steam Engine Cycle." It is interesting and is made clear by the use of the entropy temperature diagrams. The cycle of the perfect steam engine, otherwise known as the Rankine cycle, is shown in detail, and a number of problems are given. The chapter closes with several paragraphs describing the fireless locomotive, which was widely tried between 1870 and 1880.

The laws of the permanent gases are discussed in chapter 5, in about the same manner as most others have handled the subject.

The author has properly devoted considerable space to a discussion of the various gas engine cycles, as this form of heat engine will no doubt at some future time largely displace other forms of prime movers.

A short chapter is devoted to the theoretical possibilities of various types of engines, and forms an interesting and important part of the book. Refrigerating machines are also treated at length, and the various cycles generally used in practice are analyzed.

Part 2 of the book is entitled "The Application of Theory to Practice." In this part the design of the steam engine is considered in detail and the relative advantages of the various types are discussed. The last

chapters of the book are devoted to Otto gas engines, a subject with which the author is thoroughly familiar.

The appendix contains a number of useful tables, the most important of which is that giving the properties of steam. The factors in this table have been compiled and calculated from various sources, one column of importance has been added, and is the natural logarithm of the ratio of absolute temperature to that of melting ice. This factor is frequently used in practical calculations.

The author has produced a creditable piece of work, and a very important addition to the literature of this important subject.

Manual for Resident Engineers. Containing General Information on Construction. By F. A. Molitor, Chief Engineer, Choctaw, Oklahoma & Gulf Railroad, and E. J. Beard, Principal Assistant Engineer Choctaw, Oklahoma & Gulf Railroad. New York: John Wiley & Sons; London: Chapman & Hall, Limited, 1903. 16 mo., 118 pages; cloth, $1.00.

The authors state that this book was originally prepared for the guidance of the resident engineers and other employees engaged upon the extensive construction work of the Choctaw, Oklahoma & Gulf Railroad.

A considerable part of the text is devoted to very full and complete directions for conducting the field and office work of the resident engineer, but there is a very considerable quantity of matter that will be found of interest and value to the civil engineer engaged upon railroad construction. Even in the detailed instructions for carrying on the work the younger engineer will find a great many things worth noting, and those of wider experience may pick up not a few new ideas.

The contractor will feel grateful for the broad and rational view that the authors take of the relations between the engineer in direct charge of work and the contractor performing the work. "Resident engineers in their dealings with the contractors are expected to follow a courteous, business-like and ethical course; to recollect that it is the contractor's business to make all the money possible. Resident engineers are not on the work to prevent this, but to see that the contractors perform their work in strict accordance with the specifications, plans and contract."

The general recognition of the principle that the contractor is entitled to all the profit he can legitimately make upon his work, consistent with doing it in the proper manner, and that the engineer, while enforcing full and strict compliance with contracts, specifications, plans, and all necessary instructions, may very properly endeavor to promote rather than antagonize the interests of the contractor, would do much to prevent the hostile feeling with which each too often regards the other.

The requirement that the Resident Engineer shall keep a diary in which shall be entered daily a narrative of all important occurrences, and notes that do not properly belong in the regular books of the residency is a most important one. Such a diary may be of the utmost value in possible misunderstandings and litigation, besides recording a large amount of data that would be otherwise not preserved.

The detailed instructions for setting out easement curves are brief and explicit and the method followed is simple and practical. Tables and diagrams render the practical setting out of the easement curves used a very simple matter.

The instructions for introducing vertical curves at changes of grade are terse and clear and the requirement that the vertical curves connecting sagging grades shall be made as long as practicable is very commendable.

In computing the quantities of excavation and embankment from the cross sections the method of averaging end-areas is directed to be used, but to avoid the errors of this method, where the end-areas differ greatly in magnitude, it is directed that cross-sections must be taken with such frequency as to avoid a greater difference than 3 ft. between the center heights of adjoining cross-sections. This is hardly good practice, since time and labor would be saved by making cross-sections only where changes in conformation of the surface require them, and applying the proper correction to the volume, where the end-areas differ from each other sufficiently to make correction desirable.

The importance of full and explicit records of all facts, dimensions, quantities and dates is strongly and insistently enjoined upon the resident engineers and others connected with the work. The authors had doubtless learned from previous experience how difficult it is to get the busy engineer on the work to keep up records properly.

The standard general specifications of the road are printed at the end of the book. They can scarcely be regarded as models of the best modern practice in framing specifications. They seem to indicate hasty preparation, which was perhaps unavoidable. Appended to the book is a set of the usual quantity tables for level cross-sections, but it is distinctly stated that these are to be used in preliminary work only. Numerous cuts and diagrams, and model pages of note books are used to illustrate the text.

Kinematics of Machines. By R. J. Durley, B. Sc., Ma. E., Professor of Mechanical Engineering, McGill University. 379 pages, 6 x 9 in., 230 illustrations, index. New York: John Wiley & Sons. London: Chapman & Hall, Limited. 1903. Price $4, cloth.

The author has written a text book for engineering students based on his course of lectures. There is nothing distinctly new or novel in the contents or in the method of treatment. The book deals only with the kinematics of machines, although problems involving questions of a dynamical nature are given.

Graphical methods have been freely used in the opening chapters in developing the fundamental principles of acceleration and velocity and the application of the calculus to such problems is made clear. This is a commendable method, as trouble is found by some students in grasping the full graphical significance of the differentials of a function of two variables.

Other chapters discuss the properties of certain plane mechanisms, the alteration and transformation of mechanisms, the forms of wheel teeth and cams, the various kinds of ratchet mechanisms and mechanisms involving non-rigid links. Under the latter heading the kinematics of screw gearing, of worm gearing and of ball and roller bearings is treated at considerable length. The concluding chapter contains an academic sketch of the various attempts which have been made to classify machines from purely kinematic considerations.

The index is complete and adds to the usefulness of the book.

Proceedings of the 33d Annual Convention of the Master Car and Locomotive Painters' Association. 1902. Robert McKeon, Secretary, Kent, Ohio.

This is the annual publication of the Association, and contains 120 pages and portraits of W. C. Fitch, President for the current year; C. A. Cook, First Vice-President; John Laufersiek, Second Vice-President, and Robert McKeon, Secretary and Treasurer. In addition to committee reports, there are several papers on Association topics, and minutes of the ensuing discussion.

TRADE CATALOGUES.

The McConway & Torley Co., Pittsburg, Pa., is sending out a neat object lesson on the merits of the Kelso coupler made by the company. It is a quarter size model of a coupler, nickel plated and mounted on a small pedestal to be used as a paper weight. The Kelso is one of the latest couplers on the market and it is meeting with much favorable comment. All the good points of the Janney coupler have been embodied in the Kelso with the additional feature of an automatic lockset that cannot be rattled down and which acts as a positive lock to the lock when the cars are coupled. The lock has a large bearing surface on the knuckle and bears directly against the side wall of the coupler head. Strength and simplicity are the distinguishing features of the Kelso coupler. It is made of cast-steel with steel knuckle and either 5 in. x 5 in. or 5 in. x 7 in. shank.

The Newton Machine Tool Works, Philadelphia, has sent us a 12-page pamphlet, chiefly devoted to the description of a new key-seating machine. The machine in question has two spindles, one of which is horizontal and the other is vertical. The horizontal spindle carries a usual milling cutter for cutting the seat and the vertical spindle carries a finishing cutter for rounding the ends of the keyway. The two cutters are, of course, not in the same vertical plane, but a stop on the front of the machine brings the center of the vertical spindle directly over the keyway already milled. The last six pages contain miniature half tone engravings of a variety of machine tools made by the company.

The Allis-Chalmers Co., Chicago, Ill., sends its catalogue No. 15, sixth edition, entitled "Cement Machinery." The book is illustrated and contains 72 pages, including an index. It describes the various processes generally used in this country in the manufacture of Portland cement, together with the machines and accessory apparatus used in that industry. The machines which are made by this company appear to cover the field. Attention is called to the Gates ball and tube mills, which have a number of features of interest.

The Northern Engineering Works, Detroit, Mich., has sent us their crane catalogue No. 15, which freely illustrates the various types and designs made by this company. The illustrations include three, four and five motor electric traveling cranes of from three to 50 tons capacity, hand-power cranes, jib cranes and locomotive cranes of standard design. The catalogue is standard size, 6 in. x 9 in., and contains 50 pages.

The Book of the Royal Blue.—The monthly publication of the Baltimore & Ohio passenger department has in its February issue a sketch of the John Brown insurrection at Harpers Ferry, in 1859, with portraits of Brown, President Buchanan, Governor Wise and other principal actors, including Samuel P. Smith, Master of Transportation of the Baltimore & Ohio; also views of Harpers Ferry in 1859 and during the war.

Messrs. G. M. Davis & Son, of Palatka, Fla., have recently issued a new catalogue, giving descriptions, illustrations and prices of cypress tanks, together with much valuable hydraulic information. This firm has built up a large trade for its product.

Battery and Relay Shelters; Union Switch & Signal Co.—Section 13 of the Interlocking and signaling catalogue recently announced by this company has just been issued. It is an illustrated pamphlet of 20 pages, and the nature of the contents is well indicated by the title. Wooden and iron battery chutes, relay posts, cast-iron cases, etc., are fully illustrated.

The Department of Commerce and Labor.

The Department of Commerce and Labor, established by the law which has just passed Congress and been approved by the President, will be made up of the following bureaus and commissions:

Bureau of statistics from the Treasury Department.
Bureau of statistics from the State Department.
Department of labor, unattached.
Light-house establishment, from the Treasury Department.
Steamboat inspection service, from the Treasury Department.
Bureau of standards, from the Treasury Department.
Coast and geodetic survey, from the Treasury Department.
Bureau of immigration, from the Treasury Department.
Bureau of navigation, from the Treasury Department.
Census office, from the Interior Department.
Fish commission, unattached.
Shipping commission, from the Treasury Department.

And a newly-created bureau of corporations, whose head is to be a commissioner at a salary of $5,000 a year. He will have an assistant at $3,500.

The interstate commerce commission is left where it is, independent. The statistical divisions of the State and Treasury Departments are removed to the new department, while that of the Agricultural Department, closely related to interior commerce, is left where it is. The light-house service is transferred, while the life-saving service, closely connected therewith, is not.

The first secretary of the new department is George B. Cortelyou, hitherto secretary to the President, and the first Commissioner of the Bureau of Corporations will be James R. Garfield. The section of the law creating this bureau provides that:

The said commissioner shall have power and authority to make, under the direction of the Secretary of Commerce and Labor, diligent investigation into the organization, conduct and management of the business of any corporation, joint stock company or corporate combination engaged in commerce among the several States and with foreign nations, excepting common carriers subject to "An act to regulate commerce," approved Feb. 8, 1887, and to gather such information and data as will enable the President of the United States to make recommendation to Congress for the regulation of such commerce, and to report such data to the President from time to time as he shall require; and the information so contained, or as much thereof as the President may direct, shall be made public. . . . The said Commissioner shall have and exercise the same power and authority in respect to corporations, . . . as is conferred on the Interstate Commerce Commission in said "act to regulate commerce" . . . so far as the same may be applicable, including the right to subpoena and compel the attendance and testimony of witnesses and the production of documentary evidence and to administer oaths. . . .

It shall also be the province and duty of said Bureau of Corporations, under the direction of the Secretary of Commerce and Labor, to gather, compile, publish, and supply useful information concerning corporations doing business within the limits of the United States, which shall engage in interstate commerce or in commerce between the United States and any foreign country, including corporations engaged in insurance, and to attend to such other duties as may be hereafter provided by law.

The Elkins Bill.

The Act amending the Interstate Commerce law, introduced in Congress by Senator Elkins in January, has been passed by both houses and has become a law. It provides in substance as follows:

That anything done or omitted to be done by a corporation common carrier, subject to the Act to regulate commerce and the Acts amendatory thereof which, if done or omitted to be done by any director or officer thereof, or any receiver, trustee, lessee, agent, or person acting for or employed by such corporation, would constitute a misdemeanor under said Acts or under this Act shall also be held to be a misdemeanor committed by such corporation, and upon conviction thereof it shall be subject to like penalties as are prescribed in said Acts or by this Act with reference to such persons except as such penalties are herein changed. The wilful failure upon the part of any carrier subject to said Acts to file and publish the tariffs or rates and charges as required by said Acts or strictly to observe such tariffs until changed according to law, shall be a misdemeanor, and upon conviction thereof the corporation offending shall be subject to a fine not less than $1,000 nor more than $20,000 for each offense; and it shall be unlawful for any person, persons, or corporation to offer, grant, or to give or to solicit, accept, or receive any rebate, concession, or discrimination in respect of the transportation of any property in interstate or foreign commerce by any common carrier subject to said Act to regulate commerce and the Acts amendatory thereto whereby any such property shall by any device whatever be transported at a less rate than

that named in the tariffs published and filed by such carrier, as is required by said Act to regulate commerce and the Acts amendatory thereto; or whereby any other advantage is given or discrimination is practiced. Every person or corporation who shall offer, grant, or give or solicit, accept or receive any such rebates, concession, or discrimination shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine of not less than $1,000 nor more than $20,000. In all convictions occurring after the passage of this Act for offenses under said Acts to regulate commerce, whether committed before or after the passage of this Act, or for offenses under this section, no penalty shall be imposed on the convicted party other than the fine prescribed by law, imprisonment wherever now prescribed as part of the penalty being hereby abolished. Every violation of this section shall be prosecuted in any court of the United States having jurisdiction of crimes within the district in which such violation was committed or through which the transportation may have been conducted; and whenever the offense is begun in one jurisdiction and completed in another it may be dealt with, inquired of, tried, determined, and punished in either jurisdiction in the same manner as if the offense had been actually and wholly committed therein.

In construing and enforcing the provisions of this section the act, omission, or failure of any officer, agent, or other person acting for or employed by any common carrier acting within the scope of his employment shall in every case be also deemed to be the act, omission, or failure of such carrier as well as that of the person. Whenever any carrier files with the Interstate Commerce Commission or publishes a particular rate under the provisions of the Act to regulate commerce or Acts amendatory thereto, or participates in any rates so filed or published, that rate as against such carrier, its officers, or agents in any prosecution begun under this Act shall be conclusively deemed to be the legal rate, and any departure from such rate, or any offer to depart therefrom, shall be deemed to be an offense under this section of this Act.

Sec. 2.—That in any proceeding for the enforcement of the provisions of the statutes relating to interstate commerce, whether such proceedings be instituted before the Interstate Commerce Commission or be begun originally in any circuit court of the United States, it shall be lawful to include as parties, in addition to the carrier, all persons interested in or affected by the rate, regulation, or practice under consideration, and inquiries, investigations, orders, and decrees may be made with reference to and against such additional parties in the same manner, to the same extent, and subject to the same provisions as are or shall be authorized by law with respect to carriers.

Sec. 3.—That whenever the Interstate Commerce Commission shall have reasonable ground for belief that any common carrier is engaged in the carriage of passengers or freight traffic between given points at less than the published rates on file, or is committing any discriminations forbidden by law, a petition may be presented alleging such facts to the circuit court of the United States sitting in equity having jurisdiction; and when the act complained of is alleged to have been committed or as being committed in part in more than one judicial district or State, it may be dealt with, inquired of, tried, and determined in either such judicial district or State, whereupon it shall be the duty of the court summarily to inquire into the circumstances, upon such notice and in such manner as the court shall direct and without the formal pleadings and proceedings applicable to ordinary suits in equity, and to make such other persons or corporations parties thereto as the court may deem necessary, and upon being satisfied of the truth of the allegations of said petition said court shall enforce an observance of the published tariffs or direct and require a discontinuance of such discrimination by proper orders, writs, and process, which said orders, writs, and process may be enforceable as well against the parties interested in the traffic as against the carrier, subject to the right of appeal as now provided by law. It shall be the duty of the several district attorneys of the United States, whenever the Attorney-General shall direct, either of his own motion or upon the request of the Interstate Commerce Commission, to institute and prosecute such proceedings, and the proceedings provided for by this Act shall not preclude the bringing of suit for the recovery of damages by any party injured, or any other action provided by said Act approved Feb. 4, 1887, entitled An Act to regulate commerce and the Acts amendatory thereof. And in proceedings under this Act and the Acts to regulate commerce the said courts shall have the power to compel the attendance of witnesses, both upon the part of the carrier and the shipper, who shall be required to answer on all subjects relating directly or indirectly to the matter in controversy, and to compel the production of all books and papers, both of the carrier and the shipper, which relate directly or indirectly to such transaction; the claim that such testimony or evidence may tend to criminate the person giving such evidence shall not excuse such person from testifying or such corporation producing its books and papers, but no person shall be prosecuted or subjected to any penalty or forfeiture for or on account of any transaction, matter, or thing concerning which he may testify or produce evidence documentary or otherwise in such proceeding: Provided, That the provisions of an Act entitled "An Act to expedite the hearing and determination of suits in equity pending or hereafter brought under the Act of July 2, 1890, entitled 'An Act to protect trade and commerce against unlawful restraints and monopolies,' 'An Act to regulate commerce,' approved Feb. 4, 1887, or any other Acts having a like purpose that may be hereafter enacted, approved Feb. —, 1903," shall apply to any case prosecuted under the direction of the Attorney-General in the name of the Interstate Commerce Commission.

Sec. 4.—That all Acts and parts of Acts in conflict with the provisions of this Act are hereby repealed, but such repeal shall not affect causes now pending nor rights which have already accrued, but such causes shall be prosecuted to a conclusion and such rights enforced in a manner heretofore provided by law and as modified by the provisions of this Act.

Sec. 5.—That this Act shall take effect from its passage.

The Economy of Large Ships.*

BY A. W. ROBINSON.

There is a marked tendency to increase the size and carrying capacity of ships, and it is a recognized fact that great economy results from such increase. It will be of interest to consider the limitations which govern this increase, and endeavor to obtain a clearer idea of the present stage in the development, and what may be expected in the near future. Especially will this be of interest in view of the general desire to obtain a faster Canadian line, and also to improve the freight service.

It has been found that the propelling power required for a vessel for a given speed increases in a slower ratio than the increase of its displacement, and in this fact is found the main secret of the superior economy of large vessels. A good deal has been done during the past 10 years in the improvement of engines and boilers of ships, and in the reduction of weight and space occupied by them, but this improvement is small compared with the increased economy produced by increasing the size alone. During the past 10 years the paying load carried by a representative ocean cargo steamer has about doubled, while the average increase in fuel economy has been reduced from 1.52 lbs. coal per horse-power per hour to 1.48 lbs. In this connection I may quote from a paper by Mr. James McKechnie, recently read before the Institution of Mechanical Engineers, on "Marine Engineering During the Last Ten Years." Mr. McKechnie states:

"A ship to carry 5,000 tons requires machinery of 3,475 i.h.p. to propel her at 13 knots, while in the case of a ship of treble the capacity the power is scarcely double. In other words, the consumption of coal per hundred ton-miles in a now relatively small ship, taking 5,000 tons of cargo, is 8 lbs., while the vessel taking 16,000 tons uses only 4.4 lbs. per hundred ton-miles, the rate of consumption per unit of power per hour being assumed in all cases at 1.5 lb. Not only is the fuel consumption per ton carried less, but the first cost per ton carried need not be greater, and the working expenses per ton generally are lower, because mechanical means are introduced more freely for many purposes, while the personnel does not increase pro rata with size."

It seems to be generally recognized that an ordinary sea speed of 13 knots is favorable for cargo-carrying economy, and the horse-power and coal consumption per 100 ton-miles for different sized ships of from 5,000 to 14,000 tons dead-weight carrying capacity at this speed is indicated in the following table by Mr. McKechnie:

Fuel Economy of Large Cargo Steamers for the North Atlantic Trade.

Dead-weight. Tons.	Displacement. Tons.	Draft.	Speed at sea. Knots.	Coal per 100 ton-miles. Based on 1/5 lb.
5,000	8,640	24′ 6″	13	8.0
6,000	10,240	25′ 6″	13	7.1
8,000	13,500	27′ 0″	13	6.05
10,000	16,750	28′ 7″	13	5.42
12,000	19,850	30′ 0″	13	4.97
14,000	23,070	31′ 3″	13	4.66
16,000	26,150	32′ 4½″	13	4.4

With the present contemplated depth of the St. Lawrence ship channel, we can employ vessels 520 ft. long, 61 ft. beam, and 30 ft. draft, which can carry 12,000 tons dead-weight at 13 knots sea speed on 5 lbs. of coal per 100 ton-miles. It need hardly be said that this represents a vessel of considerably larger size than the average now frequenting Montreal, and it clearly indicates that the day of the small ship has passed, except for conditions under which large ships are inadmissible. We have not reached finality in 30 ft. depth of our channels. Vessels now building for New York will draw 36½ ft., and will not be able to load to full capacity until the new 40 ft. channels now being dredged for New York are completed.

There are other commercial considerations in favor of the large vessel for the St. Lawrence route. The first of these is that a large vessel such as we have under consideration will usually be commanded by higher salaried and more competent officers than a smaller ship or tramp vessel. This means that the accidents, due to ignorance or negligence, and which may be classed as avoidable, will be reduced. There are also risks of the sea which may be classed as unavoidable. These will also be less with a large ship than with a small one, for the reason that the large ship does the work of, say, three small ones, or, in other words, carries as much cargo in one voyage as the smaller vessel will do in three. Consequently the risk from unavoidable disasters is one-third in point of time of exposure to such disasters for a given amount of commerce, and furthermore the large ship is more staunch and seaworthy, and thus better able to withstand the stress of the sea.

The coal consumption of the "Celtic" is equal to about 4 lbs. per 100 ton-miles, and is a most remarkable result, considering her very fair speed. A very similar vessel has recently been launched for the same line called the "Cedric." This type of ship combines immense carrying capacity and great economy with moderate speed, and, owing to her great size, can carry a large amount of passenger accommodation on the upper deck without interfering with cargo space. This type of ship is coming into great favor with passengers owing to the greater roominess and steadiness as compared with small ships. With a light wind abeam, the writer observed that the rate of lateral oscillation of the "Celtic" was only about 2½ times per minute. This is so slow as to cause practically no inconvenience to the most susceptible, and the angle was also very small.

Another very successful and economical ship of this type is the "Saxonia," of the Cunard Line. This vessel is of 19,808 tons measurement, and has a carrying capacity of 10,400 tons dead-weight. The mean result of the engineer's log for a number of trips during the year 1900 showed the following:

Average speed	14.5 knots
Indicated horse-power	10,078
Coal per day	138 tons
Coal per horse-power per hour	1.28

It is an unnecessary truism to say that large ships will not be economical unless they can be filled, but this aspect of the question merits more than passing notice. The difficulty of providing cargo for these large vessels is very great, and their advantage will not be realized unless there is a corresponding growth all along the line in facilities for receiving, warehousing and rapid handling of the different kinds of freight in large quantities.

The price of speed is so great that it precludes carrying freight economically or carrying freight at all, and the present tendency of British practice for general freight and passenger service is towards a type of vessel which combines moderate speed with large carrying capacity. It will be interesting to compare the speed and carrying capacity of the two largest ships in the world now building, the "Cedric" and the "Kaiser William II."—the "Cedric," representing a type of vessel having large capacity combined with moderate speed, and the "Kaiser William II." representing a type in which everything is sacrificed to speed.

	Displacement.	I. H. P.	Speed.	Dead-weight.	Pass. accommodation.	Tons coal per day.
"Cedric"	37,800	14,000	17	18,000	3,000	260
"Kaiser Wm. II."	26,000	40,000	24	none	1,800	750

It is apparent from the foregoing figures that the extra seven knots speed is obtained at the cost of an additional coal consumption of nearly 500 tons of coal per day, and that the passenger accommodation is much less and the cargo capacity entirely lost. This will give some idea of the enormous cost of high speed.

*Extracts from a paper before the Canadian Society of Civil Engineers.

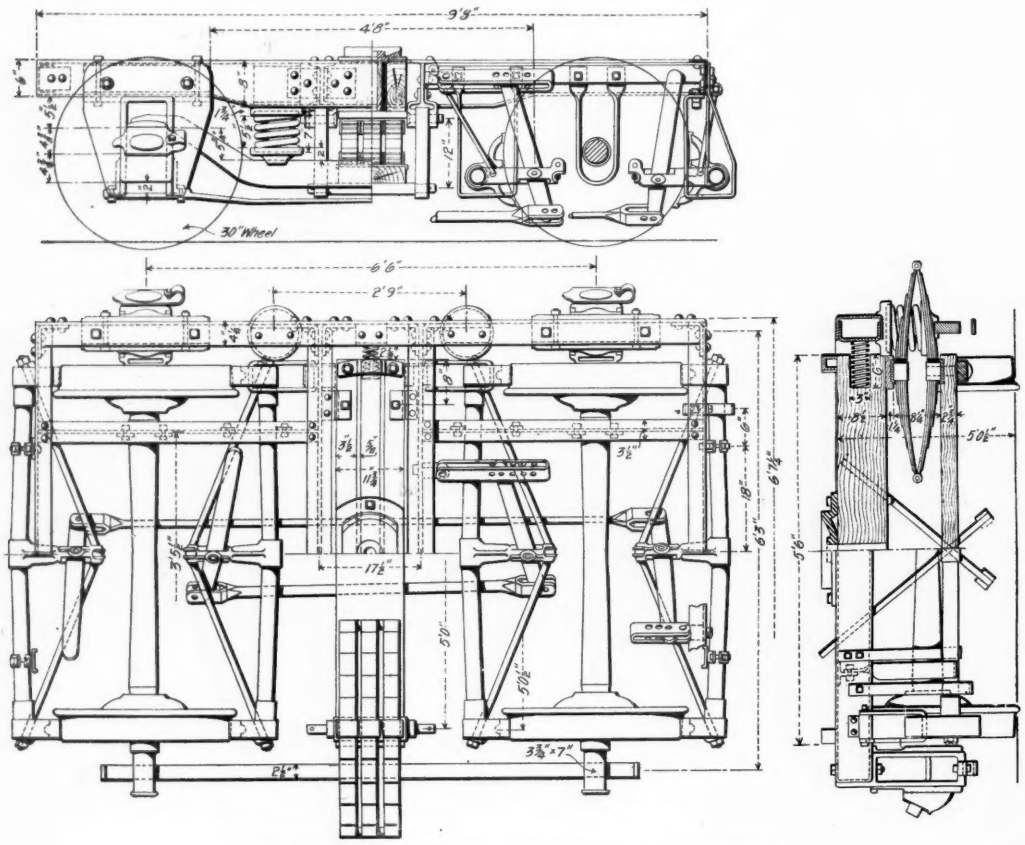
British and American Locomotives.

At the second meeting this session of the Newcastle Association of Students of the Institute of Civil Engineers Mr. Wilson Worsdell, president, read a paper, in the geological lecture room, Durham College of Science, on "The Mileage and Lifetime of English and American Locomotives," treating under this heading the age and mileage of boilers and crank axles, the age of fire-boxes, and the use of steel or copper for fire-boxes. On English railroads, he said, it was found to be most economical that locomotives should go through the shops for repairs every two years, for the longer an engine was run beyond that time the more costly was it to repair. Copper fire-boxes were generally used in England for the home companies had not been successful with steel boxes. Some were tried 10 or 12 years ago, but the longest lifetime of them was about two years. That was remarkable, because steel boxes were in general use in America. How that was done he had not been able to discover, because he took it that across the Atlantic there would be just as great difficulties experienced with bad weather as in England. One English company, Mr. Worsdell stated, regarded the lifetime of an engine as that of the boiler, arguing that when a new boiler was fitted the engine became new. He did not agree with that view. With most of the English companies the mileage of a boiler was 350,000, and the lifetime was: Passenger boilers, nine years; goods, 14; shunting, 17; branch passenger, 16 years. He spoke strongly in favor of circular web crank axles, adopted some 18 years ago by the North-Eastern, and pointed out that among 1,500 engines fitted with these there was not one-eighth per cent. of breakages annually, whereas formerly there were over 100 per year. He held, therefore, that though the initial cost was high, the result was economical. Analyzing his data, he said the average lifetime of a locomotive on the leading English railroads was: Passenger express engines, 25 years; freight, 26 years; local passengers, 25 years; shunting engines, 27 years. The mileage of express engines varied from 700,000 to 1,000,000; freight engines, 500,000 to 850,000; local passenger and shunting engines, 500,000 to 800,000. American railroad practice was very different to that of this country's companies. The Americans did not build their engines to last so long. They aimed at an average life of 15 years, getting the utmost out of the engines during that time, and then throwing

them on the scrap heap if they could not sell them to "second-hand" roads. In England we had engines upward of 30 years old doing good work still. The average lifetime of engines on six leading American railroads was: Express engines, 18 years; freight engines, 16 years; local passengers, 19, and shunting, 22. All classes of American engines made a higher mileage than the English, the range being from one to two millions. The average lifetime of boilers differed very little from that obtained in England. Against the average of 50,000 miles run by English engines, between repairs, the Americans made 70,000 to 120,000 miles, bring their engines into the repairing shops every year and a quarter to a year and a half, as compared with two years in England.—*The Railway News*, London.

A Private-Car Truck.

Our illustration shows a truck designed for a private car by Mr. H. T. Brück, Superintendent of Motive Power of the Cumberland & Pennsylvania Railroad. A special feature of the design is the small height from the rail to the top of truck frame—the wheels being but 30 in. in diameter. This was made necessary by the low clearances on the C. & P. road.



Private-Car Truck—Cumberland & Pennsylvania Railroad.

The frames are made of pressed steel and a spring has been interposed between the ends of the truck bolster and the side-frames, a quite common way of taking up the side play in passenger car trucks. The truck is equipped with a double set of brake-beams. This was deemed necessary because the car was used as an inspection car on steep grades down which it was often run by gravity.

Inasmuch as this car was designed and built in the summer of 1898, it may be considered as one of the earliest forms of pressed steel equipment.

The Australasian Railroads in 1901-2.

Owing to the belated publication of the report upon the working of the railroads in one of the States, it has only just become possible to summarize the figures relating to the Australasian railroads for the year 1901-2. Five of the reports are for the 12 months ended June 30, 1902, but the New Zealand report is for the 12 months ended March 30, 1902, while the Tasmanian relates to the operations of the calendar year 1901.

The several statements of account have, of course, to be taken for what they are worth. There is a noticeable defect in nearly all of them, the capital expenditure being open to question. That is generally understated, owing to the practice being followed of omitting to include the discount allowed, and the charges incurred in floating some of the loans. The cost of procuring the money, where issues have been made at a discount, is also ignored. But if it is taken into account, as it should be, then the capital expenditure is really greater than represented. On the other hand, the capital account is in some instances loaded with items that should more properly be charged to working expenses. There is no doubt that this is the case in Victoria, where a good deal of what is practically non-existent rolling stock is still retained on the books at full cost value, instead of having been gradually written down by charges to working expenses account. In New South Wales, however, it is believed that the Railway Commissioners make full and proper provision for depreciation every year.

Turning to the annual interest charge debited to the railroads, it is evident that if the capital account is understated by the non-inclusion of the cost of procuring the money, interest is to a corresponding extent also understated. Then, in one State (New South Wales), the rate of interest charged is not the average rate paid on loan moneys specifically obtained for railroad purposes, but is the average rate paid on the whole of the public indebtedness.

If it is really the case that expenditure is debited against capital account, which properly falls under the heading working expenses, and that the true interest charge is greater than represented, then the conclusion is that the aggregate loss on the working of the Australasian railroads that falls on the Consolidated Revenue Fund is greater than appears from the accounts as officially stated.

It will be better in dealing with the figures to discriminate between those relating to the Commonwealth and those relating to New Zealand. Aggregates for the Commonwealth for the last three years are as follows:

Commonwealth of Australia.

	1901-2.	1900-1.	1899-1900.
Capital outlay....	£126,647,780	£123,269,028	£121,414,340
Gross earnings....	11,231,103	11,021,791	10,272,789
Working expenses.	7,545,525	7,110,867	6,292,860
Net earnings.....	3,685,578	3,910,924	3,979,930
Interest on capital expenditure	4,638,548	4,503,723	4,458,103
Loss charged to consolidated revenue funds	952,970	592,789	478,173

NEW ZEALAND RAILROADS.

A summary of the principal figures relating to the New Zealand railroads for the last three years is presented as follows:

	1901-2.	1900-1.	1899-1900.
Mean No. of miles open	2,227	2,174	2,104
Capital expenditure...	£19,496,553	£18,230,057	£17,554,272
Gross earnings.....	1,874,586	1,727,236	1,623,891
Working expenses....	1,252,237	1,127,848	1,052,358
Ratio to gross earnings, per cent.	66.80	65.30	64.80
Net earnings	622,349	599,389	571,533
Interest	754.532	715,686	694,905
Loss	132.183	116,297	123,372

During the past year the capital expenditure was £1,266,496, against £675,785 for the previous year. Of the former amount, £176,339 was expended on improvements of various kinds, and £601,650 on rolling stock, brakes, workshop machinery, etc. A good deal of work of a similar description remains to be done, and with the increase of traffic, heavier rails, heavier types of engines, and stronger bridges are required.

The gross earnings show a fairly continuous increase, notwithstanding that the policy has been followed of making concessions on rates and fares. While, however, the amount of the gross earnings has grown by £250,695 during the last two years, working expenses have increased by £199,879, with the result that the ratio has risen from 64.80 to 66.80 per cent. The increase is due to the increasing age of the lines, the necessity for employing heavier rolling stock, of accelerating speeds, the increasing weight of trains, the large increase in the train mileage, improvements in salaries and wages, etc. In the table given above interest has been assumed at 4 per cent., but it is possible that a slightly lower rate may be adopted, in which case the loss would be relatively less than stated.—*The Economist.*

TECHNICAL.

Manufacturing and Business.

Schumacher & Boye, of Cincinnati, are adding a $10,000 building to their large plant.

Fire in the Pennsylvania R. R. shops at Pitcairn, Pa., has caused a loss of about $15,000 in the passenger car repair section and cabinet shop.

The Universal Fuel Oil Burner Co., with a capital of $500,000, has been incorporated in New Jersey by Harry J. Robert and James J. Head.

The Car Builders' Supply Co. has been incorporated under the laws of New Jersey, with $125,000 capital, by H. M. McIntosh, W. F. Sheffield and G. L. Harvey.

The Barney & Smith Car Company, Dayton, Ohio, did a business of $5,000,000 during the past ten months, and the company is reported to have orders on hand amounting to $3,000,000.

Boyer & Radford, Dayton, Ohio, have just made a large shipment of track jacks to Port Arthur for the Trans-Siberian Railway. This is the second shipment to the same road this year.

H. A. Ferguson, heretofore Assistant Superintendent of Motive Power, Chicago Great Western, is now in charge of the railroad machinery department of Joseph T. Ryerson & Son, Chicago.

J. D. Hurley and A. B. Holmes, formerly of the Standard Pneumatic Tool Co., Chicago, have allied themselves with the Rand Drill Co., New York, and will be connected with the pneumatic tool department.

The Cie Internationale des Wagons-Lits et des Grands Express Européens of Paris, France, has ordered from the Richards Chair Panel Co., Chicago, five different patterns of sample chairs for trial on their cars.

M. Wuerpel, Jr., has resigned as Signal Engineer of the Terminal R. R. Association and the St. Louis Merchants' Bridge Terminal Ry. Co., to accept service with the Taylor Signal Co. as Resident Engineer, with headquarters in St. Louis.

The Traction Elevator Co., incorporated in New Jersey last week, with $5,000,000 capital, will make elevators and all kinds of hoisting machinery. The incorporators are: Louis B. Dailey, H. O. Coughlin and Kenneth K. McLaren.

The East St. Louis Locomotive & Machine Co., which will rebuild and repair locomotives, has equipped a building in East St. Louis, Ill., with about $15,000 worth of machinery. M. M. Stephens is President, and J. P. Bay, General Superintendent.

At the annual meeting of the Standard Steel Car Company on Feb. 10, the Board of Directors was increased from seven to 11 members. The new directors are R. B. Mellon, E. H. Jennings, J. B. Brady, L. G. Woods and Henry R. Rea. Bonds for $2,000,000 will be issued.

The United States Washer & Nut Lock Co. is about to establish a shop at New Castle, Pa., to make a patent interlocking nut and bolt. The officers are: President, John P. Graham; Vice-President, James Sutherland; Secretary, Geo. Bolinger; Treasurer, Frank J. Bolinger.

The Alabama Frog & Switch Co., Anniston, Ala., has its plant equipped with modern machinery for making railroad crossings, frogs and switches, and is able to do work of this nature without delay. The officers are Thos. E. Kilby, President; M. B. Wellborn, Vice-President; Whitfield Clark, Treasurer; E. M. Kilby, Secretary and General Manager.

Commonwealth body bolsters, made by the Commonwealth Steel Co., St. Louis, Mo., will be used in the 1,200 box cars ordered recently by the Atchison, Topeka & Santa Fe, and in 2,000 coal cars recently ordered by the Missouri Pacific. Commonwealth body and truck bolsters will be used in the 700 cars recently ordered by the Chicago Great Western.

Sealed proposals will be received by H. Fernstrom, Chief Engineer of the New York Central & Hudson River Railroad, until 3 p.m., Feb. 23, for the electric wiring of the engine house, shops and yards at Oswego, N. Y. The railroad company will furnish free transportation over its lines for one representative of the successful bidder, between the nearest station on its line, to the contractor's home office at Oswego.

The Duff Manufacturing Co., of Allegheny, Pa., has contracted with the Pittsburgh Railways Co., which controls the city and suburban lines, to equip each car with a quick-acting jack for emergency use. It is suggested that such jacks should be in each baggage car of passenger trains and in each caboose of freight trains, as they are light, occupy little room, and are always ready for quick lifting of cars or debris in wrecks.

The 1903 catalogue of the Kansas City Bolt & Nut Company says that since the issuance of the previous catalogue (Sept., 1900), the company's capacity has been increased some 45 per cent. In addition to all kinds of bolts and nuts this company makes forgings for use in telegraph and telephone construction, variety iron work for bridges and buildings, coach and lag screws, railroad spikes and nut locks. All of the iron used in the works is made in the company's own rolling mill.

The Philadelphia Pneumatic Tool Co. will enlarge its present offices in the Singer Building, New York city, and instal an electrically driven air compressor and a complete plant for testing and exhibiting pneumatic tools. W. A. Battey will continue as manager of the

New York office, assisted by James H. Beaubien. The company reports that it has received recently orders for pneumatic tools for the National and Interoceanic railroads of Mexico. During two days of last week the shipments of Keller rotary drills amounted to more than $10,000.

The Cincinnati Shaper Co. has its recently completed new shop in full operation. The plant is on a 3½-acre tract midway between Colerain and Spring Grove avenues, at the west end of Elam street. The shop building is 90 x 290 ft., of the three-bay form, and is of brick and slow-burning mill construction. A two-story front, 30 x 90 ft., contains the offices and drafting rooms. This shop is devoted to making shapers of the pillar or column and traverse-head type, with their attachments. A catalogue recently issued shows these various tools, fully and carefully illustrated.

The financial statement for the year 1902 issued by the Chicago Pneumatic Tool Company shows the assets to aggregate $8,889,600, of which the principal items are $6,506,009 for real estate, buildings, plant, machinery, patents, good will, etc., and $1,096,925 for the capital stock of other companies at cost. The total authorized capital stock is $7,500,000, of which $6,031,600 has been issued; the bonded indebtedness authorized is $2,500,000, $200,000 of which is still unissued. The net profits for the year were $897,060, which, after payment of interest and dividends, reserve for sinking fund, etc., leaves as undivided profits $113,706. The company has decided to move the plant at Aurora, Ill., to Cleveland, Ohio, consolidating it with the plant located at the latter point.

Iron and Steel.

The Passaic Steel Mills Co., incorporated a few months ago in New Jersey, will shortly increase its capital from the preliminary $3,000 to $5,000,000.

According to *The Iron Age* the weekly capacity of furnaces in blast on Feb. 1, was 343,111 gross tons of pig iron, compared with 332,045 gross tons of a year ago.

Bids are wanted at the U. S. Engineer Office, Nashville, Tenn., until Feb. 28, for building four pairs of steel lock gates, filling valves, etc., for locks A and No. 1, Cumberland River.

The Ohio Pressed Steel Co., Youngstown, Ohio, has been organized, with a capital stock of $25,000. The company is to make pressed steel specialties. It will soon begin work on buildings for shops.

The Southern Railway has let contracts for about 70 spans of girders and trusses, from 30 to 200 ft. long, to be put in at various points on the system during the year, preparatory to using heavier cars and engines.

According to reports from Toronto, the Consolidated Lake Superior Co. has declined to take the contract for rails for the Temiscaming Ry., because its blast furnaces at the "Soo" are still incomplete. It is quite probable that new bids will be asked at once for these rails.

The report of the Tennessee Coal & Iron Co. for the year ended Dec. 31 shows total profits for the 12 months of $2,656,746, as compared with $1,725,637 for the preceding year. After the deduction of interest charges and sinking fund for depreciation there remains a surplus of $1,432,958, an increase of $928,744.

The Lackawanna Steel Co. has sold to Speyer & Co., and Kean, Van Cortlandt & Co., $15,000,000 first mortgage 5 per cent. convertible bonds, part of an authorized issue of $20,000,000. The first furnace fire was started at the new plant in Buffalo Feb. 11. The annual capacity of finished product will be about 1,250,000 tons.

The J. B. & J. M. Cornell Co., of Cold Springs, Putnam County, N. Y. (240 Eleventh avenue and 143 Centre street, New York city), has been incorporated in New York State, with a capital of $2,000,000, to make machinery and structural iron work. The directors are John M. Cornell and I. H. Cornell, of New York city; and C. R. Leffingwell, of Yonkers.

Archer Brown, of Rogers, Brown & Co., estimates the production of pig iron during the present year at 19,250,000 tons, or nearly 1,500,000 tons more than in 1902. Twenty-one new furnaces are now building, which will add 2,000,000 tons to the pig iron capacity of the country, and by the end of the year the United States will have a capacity of 23,000,000 tons, or about one-half that of the entire world. Mr. Brown says that the crest of the wave in the iron and steel industry has not been reached.

Lubricating Signal Connections in Winter.

The Marshall Oil Company, Marshalltown, Iowa, has an oil intended for lubricating signal connections and all kinds of outdoor machinery in winter, for which it is claimed that it successfully withstands a cold test of 15 to 18 deg. below zero. It is said that apparatus lubricated with this oil works freely in the coldest weather. The signal department of the Chicago Great Western uses the oil, reporting that it is the only oil found which will not freeze. It is called by the company "Rex Ice Oil." This company also makes a signal oil for illuminating purposes for which superior merit is claimed.

Rails and Fastenings Wanted in Siam.

The Royal Siamese Railway Department at Bangkok, Siam, asks for bids to be submitted by June 15, 1903. A set of drawings and specifications costs 5 ticals ($1.25). The ton is 2,205 lbs. The permanent way material wanted is: 30,000 tons rails, 950 tons spikes, 1,826 tons fish plates, 750 tons bearing plates, 270 tons bolts and nuts, 10 tons spring washers.

Knoxville, LaFollette & Jellico Bridges.

The contract for all the bridges (41 in all) on the Knoxville, LaFollette & Jellico R. R. and its branches has been let. On the main line, which extends from Saxton, Ky., to Knoxville, Tenn., there are the following steel structures: Two over Cane Creek; one, Mud Creek; one, Clear Fork River; nine, Hickory Creek; one, Davis Creek; two, Big Creek; one, Cove Creek; one, Coal Creek; one, Poplar Creek; one, Clinch River; one, Bull Run Creek; three, Beaver Creek, and seven bridges for crossings of railroads and streets and public roads. Of these bridges the most important are the Clinch River bridge, which consists of two 200-ft. spans and two 80-ft. spans; the Cove Creek viaduct, 600 ft. long, and the Coal Creek viaduct, 800 ft. long. It is proposed further to be built in connection with this road a viaduct to carry Clinch avenue, in the city of Knoxville, over the Asylum street yards of the K., LaF. & J. In addition to the above, the Clear Fork Branch has seven girder bridges and the Cow Creek Branch has two girder bridges.

Louisiana Red Cypress for Railroad Use.

Louisiana red cypress is being extensively used by the Southern Pacific, the Chicago, Rock Island & Pacific, the Frisco, the Ft. Worth & Denver, the Gould Lines and other roads. It is said to be excellent material for car siding and roofing, cross-ties, cross-arms and shingles. It is particularly good for water tanks. For this purpose the stock is used absolutely green and immediately upon completion of the tank it is pumped full of water and kept so. With this treatment the wood remains in its natural state, and there is no trouble from bursting of hoops. The durability of this wood makes it especially desirable for exposed work, but durability is not its only good quality: it produces handsome effects in interior finishing. The Western Union Telegraph Co. and the lines of the Standard Oil Co. use this cypress quite generally for cross-arms, and it is so durable that paint is used, they say, only for appearance. The Whitecastle Lumber & Shingle Co., Ltd., Whitecastle, La., supplies the roads above-mentioned with their red cypress lumber.

Signaling Notes.

The Delaware, Lackawanna & Western now uses blue glass instead of red for the night stop indication in all dwarf and pot signals; and by the adoption of this practice has removed a considerable number of red lights from the path of the enginemen of fast trains. On this road the lower of the two high arms on a two-arm semaphore signal is so arranged that its light is blinded, except when the arm is in the all clear position, so that an engineman looking for the upper light—that is to say, the runner of a train on the high speed route—never has a red light against him at such a signal unless it is the one which indicates for the upper arm, and which therefore is a stop signal for his train. Such an engineman sees no red light at an interlocking plant, except in cases where there are more than two main tracks.

German Electric Companies To Consolidate.

According to despatches from Berlin the Siemens-Halske and Schuckert Electrical Companies have decided to unite, subject to the approval of the stockholders. The Siemens-Halske Company has a capital of $13,625,000 and $7,500,000 in debentures. The Schuckert Company, which latterly was in financial difficulties, has a capital of $10,500,000 plus $7,000,000 of the Continental Financing Company. The new company will have a capital of $22,500,000, and will be known as the Siemens-Schuckert Works.

Bids For Krupp Armor.

Bids for supplying 5,666 tons of Krupp armor for the battleships "Connecticut" and "Louisiana" were opened at the Navy Department in Washington, Feb. 12. The Carnegie and the Bethlehem Steel Companies had agreed to furnish armor at not more than $420 a ton. The two companies were the only bidders: their prices range from $400 to $420 a ton, and the contract will be equally divided between them. The total of the bids was $2,333,640. The Bethlehem company also bid $52,800 for supplying 152 tons of armor bolts and nuts.

THE SCRAP HEAP.

Notes.

It is announced in Chicago that compartment sleeping cars will no longer be run between Chicago and St. Louis.

According to the *Minneapolis Times* the Chicago & North Western has issued a rule that only live stock and perishable fruit shall be moved on Sunday, though during the present stress coal will be classed as perishable.

A press despatch from St. Louis says that the St. Louis Southwestern, the St. Louis & San Francisco and the Missouri Pacific have made advances in the wages of employees of 12 and 15 per cent., the same as was done by the Missouri, Kansas & Texas a week ago.

The Boston & Northern and the Old Colony, the two principal street railroad companies in Eastern Massachusetts outside of Boston, have increased the pay of conductors and motormen at rates varying for different classes, but to an amount sufficient to make an average increase of 12 per cent. The number of men affected is about 2,500.

Burlington express train No. 6 was stopped by robbers on the morning of Feb. 12 about 1 o'clock, near Homestead, Mont., on the Northern Pacific, and the express car was wrecked by dynamite. A mail clerk was shot. The amount of booty taken by the robbers is reported as small. Two or more of the robbers were caught within a day or two and the reports say that one of them made a confession.

Newspapers in the State of Washington report that the eastbound Great Northern overland train of Feb. 5 was stuck in the Cascade tunnel for one hour and 35 minutes on account of an accident to the air-brakes, and that the two engine crews and trainmen, and many passengers, were overcome by gas. The gas was so heavy that it extinguished the lights in the cars. A passenger named Abbott finally made his way to the locomotive, where the engine crew was lying unconscious, and succeeded in starting the air-pump and releasing the brakes. The train then backed through to the west end of the tunnel, it being all down grade, and ran onto the safety spur at the entrance. The conductor, brakeman and two lady passengers were still unconscious when the train passed through Wenatchee several hours afterward.

Lackawanna Shops—Change of Location.

Owing to the mining operations under the proposed site for the new shops of the Delaware, Lackawanna & Western in the Keyser Valley, it has been found desirable to change their location. They will be in the same valley, but farther north. The layout for the shops will remain the same as that shown in the *Railroad Gazette*, Jan. 9, 1903, with a rearrangement of the receiving yard.

Offending an Influential Shipper.

The Tennessee State Prison Commissioners have filed complaint with the railroad commission against the Harriman & Northeastern and the Cincinnati, New Orleans & Texas Pacific railroads, alleging that by failure to furnish cars at the State mines the State lost the sale of 36,000 tons of coal that could have been marketed without additional cost; that great loss was sustained during January by failure to furnish cars, twenty-eight per day being needed. It is also charged that the contract has been violated, while other adjacent mines have had all the cars needed. A higher rate is also alleged, shutting the State mines out of Chattanooga market.

Railroad Mileage in Russia.

Consul Samuel Smith reports to the government from Moscow that the total mileage of railroads in Russia on Sept. 1, 1902, was 37,319 miles, of which 6,387 were double track. At the present time 4,921 miles are building by the government and 1,582 miles by the Chinese railroad company. Besides this, 2,194 miles are projected to be built.

New Railroad in Portuguese East Africa.

U. S. Consul J. H. Thieriot, of Lisbon, reports that a contract has been approved between the Portuguese Government and Robert Williams, an Englishman, for a railroad 870 miles long, which is to start from the Bay of Lobitio, on the Atlantic coast, and run through the province of Angola. A guarantee of $420,000 has been deposited. The Portuguese Government grants the contractor the right, for 10 years, to all minerals within an area of 75 miles on each side of the line. There is no absolute concession of land nor any immunity from taxes, in the terms of the decree.

Improvements at Rensselaer Polytechnic Institute.

The Chemical Laboratory and the Proudfit Memorial building, which were recently partially destroyed by fire, are being rebuilt. Both will be greatly improved. The Chemical laboratories will be contained in two adjacent and connected buildings. These buildings contain 10 rooms and include a large lecture room equipped with facilities for lectures on general chemistry, two large main laboratories for quantitative and qualitative analysis, one small laboratory for special work, a laboratory containing the necessary furnaces and muffles for assaying, and a special laboratory for the analysis of water. There is also a library containing special works on chemistry, and a recitation room. Besides these, there will be weighing rooms and various closets and rooms for apparatus, carboys of acid and the other equipments usual in chemical laboratories.

The Proudfit Memorial Laboratory will be greatly enlarged. As completed the main building will have three stories and basement. There will be 16 rooms. Thirteen of these rooms will be used for the laboratories and lecture rooms of the Department of Physics and Electricity. Unusually complete sets of generators and motors with the necessary meters, indicators and brakes, as well as a large storage battery, will be installed in the electrical laboratory. One room will be used for a shop for the construction and repair of apparatus. The other three rooms in the building will be used as laboratories for the Department of Mechanics. One will contain the 100,000-lb. and 300,000-lb. testing machines driven by an electric motor, as well as a wire testing machine and one of 50,000 lbs. capacity for testing long columns. Another room will be completely equipped as a modern cement testing laboratory. The third will contain a rattler for testing paving bricks.

Adjacent to this building will be the boiler house containing two 75-h.p. Babcock & Wilcox boilers, one with a superheater for experimental tests. This building will also contain a steam turbine.

Placing the Blame, in France.

A few months ago in passing a switch at Arleux, in France, an express train was thrown from the track and 21 persons were killed and many more injured. Three men were tried and condemned on account of this accident. The switchman, who apparently was unable to lock the switch in position because of some defect, was sentenced to four months' imprisonment and 50 francs' fine, because not having locked the switch, he did not hold it in position with the lever till the express had passed, and did not signal the train to slacken speed. The stationmaster was sentenced to six months' imprisonment and 200 francs' fine, because he did not exercise proper inspection and chain the switch fast, aggravated by the fact that he had previously been reproved for similar negligence. Finally, a district foreman, who had had charge of making some changes in the switch, was fined 1,000 francs, because he neglected to notify the stationmaster that something broke while he was making these changes.

LOCOMOTIVE BUILDING.

The Cornwall & Lebanon is having two locomotives built at the Baldwin Works.

The East Jordan Lumber Co. is having one locomotive built at the Baldwin Works.

The Velardina Mining & Smelting Co. is having two locomotives built by the H. K. Porter Co.

The Santa Fe Central is having five locomotives built at the Pittsburg Works of the American Locomotive Co.

The Chicago & North Western is having 14 locomotives built at the Schenectady Works of the American Locomotive Co.

The Cincinnati, New Orleans & Texas Pacific is having 13 locomotives built by the American Locomotive Co. and six at the Baldwin Works.

CAR BUILDING.

The Wisconsin & Michigan is in the market for 100 ore cars.

The American Car & Foundry Co. has miscellaneous orders for 15 cars.

The Oregon Short Line has ordered one private car from the Pullman Co.

The Cincinnati, Hamilton & Dayton is reported about to build three coaches.

The Cleveland, Cincinnati, Chicago & St. Louis is building 300 flat cars at its own shops.

The Kansas City Southern has ordered 250 box cars from the American Car & Foundry Co.

The Fort Smith & Western has ordered 250 40-ton coal cars from the American Car & Foundry Co.

The Chicago Great Western is in the market for 200 38-ft. refrigerator cars of 60,000 lbs. capacity.

The Santa Fe Land Improvement Co. has ordered 1,500 30-ton box cars from the American Car & Foundry Co.

The Norfolk & Western is having 500 freights built at the Allegheny Works of the American Car & Foundry Co.

The Great Northern has ordered 500 hopper bottom coal cars of 100,000 lbs. capacity from the Standard Steel Car Co.

The Peoria & Pekin Union has placed an order for a number of hopper cars with the American Car & Foundry Co.

The Illinois Central is preparing to build, at its Burnside shops, four specially designed coaches for suburban service.

The Kingan Refrigerator Line (Indianapolis) has ordered 50 refrigerator cars from the American Car & Foundry Co.

The Terminal Association of St. Louis is having 50 freights built by the Pease Car & Locomotive Co., Chicago.

The California & Northwestern is having 20 freights built at the Huntington Works of the American Car & Foundry Co.

The Rodger Ballast Car Co. is having 500 freights built at the West Detroit Works of the American Car & Foundry Co.

The Apex Equipment Co. has received an order from the Barber Asphalt Paving Co. for 26 standard gage flat cars of 40,000 lbs. capacity, for April delivery.

The Atlanta & West Point has ordered 70 box cars from the American Car & Foundry Co. A description of these cars may be found in our issue of Jan. 9, 1903.

The Chicago, Burlington & Quincy, reported in our issue of Dec. 12 as having ordered 90 coaches from the American Car & Foundry Co., is having 40 of these built at the Wilmington Works.

The New York Central & Hudson River has increased its order of 150 cars with the Rodger Ballast Car Co. by 100, making a total of 250 cars. These are to be built upon M. C. B. standards and will be delivered early in the year.

The Pennsylvania has placed an order at its Altoona shops for 31 standard class PK passenger coaches, with wide vestibules, and 11 standard class VN baggage and express cars, for the Lines West of Pittsburg. This company has ordered 500 40-ft. steel gondolas of 100,000 lbs. capacity, with 45-in. sides and drop bottoms, from the American Car & Foundry Co. This order was incorrectly given in this column Feb. 13.

The Michigan Central, as reported in our issue of last week, has ordered three horse express cars from the Pullman Co. The cars will be 61 ft. 10 in. long over end sills and 9 ft. 8 in. wide over side sills. The special equipment includes: M. C. B. axles, "Diamond" special brake-beams, Westinghouse air-brakes, National-Fulton brasses, National couplers, Westinghouse friction draft rigging, Standard steel type "B" platforms, six-wheel trucks and wrought wheels, Boise tires.

The Illinois Central is building 764 flat cars of 80,000 lbs. capacity at its Burnside shops, for March and April delivery. The cars will be 40 ft. 7⅝ in. long and 8 ft. 6 in. wide over sills, to be built of wood, with wooden underframes. The special equipment includes: Iron and steel axles, Simplex bolsters on 500 cars and cast-steel bolsters on 264 cars, Simplex brake-beams, Lappin brake-shoes, Westinghouse air-brakes, M. C. B. Hewitt Mfg. Co.'s brasses, Trojan couplers, Gould draft rigging, Ryan dust guards, Sherwin-Williams paint, Railway Steel Spring Co.'s springs, Kindl trucks on 500 cars and Ajax trucks on 264 cars and Griffin wheels.

BRIDGE BUILDING.

ALABAMA.—The lower House of Congress last week passed a bill authorizing the Commissioners Court of Escambia County, Alabama, to build a bridge across Conecuh River.

The House has also passed a bill authorizing the County Commissioners of Geneva County, Ala., to build a bridge across Choctawhatchee River.

ARDMORE, IND. T.—W. H. Johnston, Box 82, this town, is the Engineer for the company which contemplates building a 150-ft. steel bridge. He wants to hear from bridge builders in regard to prices and plans.

ARKANSAS.—The lower House of Congress has passed a bill authorizing a wagon and foot bridge across the St. Francis River, in Arkansas.

CAMDEN, N. J.—The bids received Feb. 11 for Baird avenue draw bridge were: North Penn Iron Company, $30,097; New Jersey Bridge Company, $28,900; Aaron Ward, $26,900; National Bridge Company, $30,300; Bracket Bridge Company, of Cincinnati, Ohio, $30,775; Mt. Vernon Bridge Company, of Mt. Vernon, Ohio, $30,500; Michael Hurley, of Trenton, $27,850; F. R. Long Company, of Hackensack, $30,600. All exceeded the appropriation $20,000.

CARTHAGE, TENN.—The lower House of Congress has passed a bill authorizing a bridge across the Cumberland River, at or near Carthage, to be completed in three years from April 1, 1903.

The County Court, now in session, will appropriate funds for the proposed bridge over Cumberland River at this place. The cost will reach $60,000, and the town of Carthage is to pay one-fourth.

CHATHAM, ONT.—Bids are wanted March 26 by A. McArthur, Township Clerk, for a draw bridge over River Sydenham in the village of Tupperville.

CHILLICOTHE, MO.—The City Council is considering building a new viaduct over the C., M. & St. P. tracks.

CINCINNATI, OHIO.—Plans and specifications have been ordered made by the Board of Public Service for rebuilding the Liberty street viaduct. Probable cost, $30,000.

CLARKSBURG, W. VA.—Bids are wanted Feb. 24 for the 565 ft. bridge over Elk Creek, by the Clarksburg Industrial Co. A. Bowen, General Manager.

COHOES, N. Y.—The Gibson bridge, according to report, will be rebuilt soon, at a cost of about $30,000.

DERBY, CONN.—The New Haven Railroad, according to report, is getting plans for some bridges to be built in Derby, to eliminate grade crossings. The work also includes a bridge over the river.

EASTON, PA.—W. J. Young, Ch. Eng. of the Northampton R. R., Pen Argyl, Pa., will receive bids March 1 for a three-span pin-connected bridge 270 ft. long over a public road at Easton.

EUFAULA, ALA.—A bill was introduced in Congress on Feb. 9 authorizing the Brunswick & Birmingham R. R. to build a bridge across the Chattahoochee River, at or near Eufaula, Ala.

FARIBAULT, MINN.—The city is having plans and estimates made for a head bridge over the Chicago, Rock Island & Pacific and Chicago Great Western tracks. It will be over 1,300 ft. long.

FREDERICTON, N. B.—The Commissioner of Public Works will receive tenders to March 4, rebuilding 13 bridges, as follows: Harris bridge, Burpee bridge, Sunbury County; Bell bridge, Malone bridge, Sherwood bridge, King's County; Cody's mill bridge, Queen's County; Gervais Paulin bridge, Pokemonche bridge, Arsenau bridge, Gloucester County; Monquart bridge, Shaw Creek bridge, Carleton County, and Craig bridge, Restigouche bridge.

GRAND RAPIDS, MICH.—The Board of Public Works is estimating the cost of a viaduct across the railroad tracks on Bartlett street from Ellsworth avenue, to South Division street.

GULFPORT, MISS.—The Gulf & Ship Island R. R. will probably let contracts soon for four steel bridges.

HALIFAX, N. S.—The plans for the projected Nova Scotia Eastern Ry. from Halifax to the Strait of Canso provide for the construction of a steel bridge across the Narrows, between Halifax and Dartmouth, N. S., to cost $300,000 to $400,000. Hon. J. R. Stratton, Provincial Secretary of Ontario, Peterboro, Ont., is President of the company.

HAMILTON, ONT.—The agreement between the City Council and the Grand Trunk respecting the closing up of some streets has been ratified by the Council. The terms of settlement include the erection of three bridges at the joint cost of the railroad and the city.

HANOVER, MASS.—The proposition to build a $20,000 bridge is under consideration.

KANSAS CITY, MO.—The two Kansas Cities are considering building another viaduct connecting the two cities. The Mercantile Club or J. L. Brown, of Kansas City, Mo., may be able to give information.

KEARNEY, NEB.—Bids are wanted March 17 by the Board of County Supervisors for a bridge over Wood River.

MILWAUKEE, WIS.—Bids are wanted March 6 by the Board of Public Works for the highway bridge over North Menominee Canal at Muskego avenue. Chas. J. Poetsch, Commissioner.

MISSISSIPPI.—The lower House of Congress on Feb. 2 passed the bill authorizing the Pearl & Leaf Rivers Railroad to build a bridge across Pearl River, in Mississippi.

MONTREAL, QUE.—The Montreal-Longueuil Bridge Co., through Jules Allard, Solicitor, of Montreal, is making application to build a bridge over the St. Lawrence River to connect Montreal and Longueuil, Que. This is the second application for bridge privileges over the St. Lawrence from Montreal that will be dealt with by the Dominion Parliament next session. In 1902 there were three or more applications, none of which were passed, but the Montreal Subway Co. was incorporated to construct a tunnel between the points named.

MOORS ROCK, ARK.—A bill has been introduced in Congress authorizing a bridge across the Arkansas River, at or near Moors Rock, Ark.

NEWARK, N. J.—Bridge repairs to cost $50,000 have been authorized by the joint bridge committee of Essex and Hudson counties. The draw of the Clay street bridge is to have an electric motor.

NEWTON, MASS.—This city has had three bills introduced in the legislature for bridges.

NEW YORK, N. Y.—The present indications are that the cantilever bridge to be built over Hell Gate connecting the New York, New Haven & Hartford at Port Morris, with the Long Island R. R. on Long Island, will be built soon. This project was described and illustrated in the *Railroad Gazette* May 11, 1900; the Pennsylvania R. R. has since assumed control. The main span of the bridge will be about 840 ft. Contracts for steel have been let.

The Art Commission has approved the new design for the Blackwell's Island Bridge and specifications will be made at once so that contracts can be let during the summer.

A commission has been appointed to pass upon the revised design for the Manhattan Bridge, over East River. The length of the main structure is as follows: River span, 1,470 ft.; two land spans, 725 ft. each, 1,450 ft.; total length of main structure, 2,920 ft.; the total length of the bridge structure, including both approaches, is about 9,900 ft.

The proposed bascule bridge over Gowanus Canal at Hamilton avenue, Brooklyn, will soon come before the Board of Estimate and Apportionment for approval. It will cost $140,000.

OKLAHOMA CITY, OKLA. TER.—The City Engineer has made plans for a viaduct on Oklahoma street over the Choctaw tracks.

PENNSYLVANIA.—The lower House of Congress on Feb. 2 passed a bill authorizing the Eastern Railroad Co. to build a bridge across the Monongahela River.

PLYMOUTH, WIS.—Bids are wanted March 25 by the Town Board for building four stone and steel bridges. Elias Salsbury, Chairman.

READING, PA.—S. S. Hoff, Engineer of the Lebanon Valley R. R., is receiving bids for building the masonry of the south approach of the proposed bridge over the railroad at Front street.

ST. JOSEPH, MO.—The contract for rebuilding the Grand Island bridge across the Missouri River at this point has been let to the American Bridge Co., at about $400,000.

SALINA, KAN.—Bids are wanted Feb. 25 for two steel bridges, each 70 ft. G. J. Duncan, County Clerk.

SEAFORTH, ONT.—The County Engineer reports that three bridges will have to be built during the coming summer.

SIOUX CITY, IOWA.—The Chicago & North Western proposes to build a bridge over the new channel of the Floyd River, when it is straightened. Cost, $40,000. City Engineer J. M. Lewis can give further information.

STAMFORD, CONN.—The Stamford Street Ry. Co., according to report, is surveying for a bridge over Rippowan River at Main street.

WEISER, IDAHO.—A bill is in the State Legislature providing for a bridge over Snake River at Weiser.

YONKERS, N. Y.—It is said the New York Central has decided to build a viaduct over its tracks from Park street to Glenwood.

Other Structures.

BRIDGEPORT, CONN.—The New York, New Haven & Hartford is having plans made for the new station to be built here. Warren R. Briggs, a local architect, will supervise the work.

BROOKLYN, N. Y.—President Winter, of the Brooklyn Rapid Transit, announces that plans will be made soon for another large power house.

BRUNSWICK, GA.—The Garrett-Cromwell Engineering Co., of Cleveland, Ohio, has the contract for the buildings and machinery for the iron and steel plant proposed by the Mohawk Valley Steel & Iron Co. at Brunswick. E. R. Cummings, Worcester, Mass., is Secretary.

COUNCIL BLUFFS, IOWA.—Bids are wanted on a passenger station by the Mason City & Fort Dodge. It will be of stone and brick, 119 ft. x 30½ ft.

ELIZABETH, N. J.—Milliken Bros., of Brooklyn, N. Y., have filed plans with the Building Department for two buildings at Mariners' Harbor, where this firm is to locate its iron plant. The buildings will be 78 x 202 and 172 x 328 respectively, and will be entirely of steel. The estimated cost is $40,000. Other buildings are to be erected later.

HARRISBURG, PA.—The Pennsylvania will build a train-shed 160 ft. long at the eastern end of the present shed at the station in this city.

JERSEY CITY, N. J.—The Erie R. R. is planning to make extensive improvements at its Jersey City terminal. See "General Railroad News."

LA CROSSE, WIS.—Ori Sorrenson is interested in establishing a car building shop in La Crosse.

LINCOLN, ILL.—Plans have been made for the new Illinois Central station in Lincoln. Probable cost, $10,000.

NEW YORK, N. Y.—The Long Island R. R. has made plans for the station to be built at Flatbush avenue at the junction with the underground railroad. The dimensions are: 800 ft. long, 220 ft. wide, and 18 ft. below the street surface.

OKLAHOMA CITY, OKLA. T.—An officer of the M., K. & T. writes that in providing terminal facilities here no shops of any magnitude will be constructed but only such as are necessary to care for terminal work, including an engine house, small shop, turn-table, etc.

PEORIA, ILL.—The Peoria & Pekin Union has let a contract to J. J. Jobst, of Pekin, for a roundhouse with 85 ft. stalls, to cost $30,000. Work will be begun about April 1.

PHILADELPHIA, PA.—Plans have been made by the Pennsylvania for a new roundhouse in West Philadelphia to replace one destroyed.

ROANOKE, VA.—The Norfolk & Western is making plans for a new station here.

TACOMA, WASH.—The Tacoma Chamber of Commerce is interested in a proposition to build railroad car shops. One of the promoters is H. H. Warner, Master Mechanic of the Northern Pacific at Tacoma.

TOLEDO, O.—Condemnation proceedings have been begun for the new Toledo Central station.

TRENTON, N. J.—The Ferro-Concrete Construction Co. has the contract to build part of the new plant for the J. L. Mott Iron Works. There will be four buildings, at present, the walls of which will be of concrete. The power plant was designed by Messrs. Adams & Schwab, of Baltimore.

WASHINGTON, D. C.—The Sundry Civil appropriation bill which was passed by the House of Representatives on Feb. 14 carries appropriations for extending the central portion of the east front of the Capitol building, and for a site and the erection of an office building for members of the House just south of and adjoining the Capitol grounds; $500,000 is appropriated for the Capitol extension. The office building is not to exceed in cost $3,100,000 exclusive of the site.

WILMINGTON, DEL.—Building permits have been issued to the Pennsylvania R. R. for a car erecting shop to cost $56,000; paint shop, $51,000, and oil and waste storehouse, $7,620, and paint storehouse, $7,000. This makes a total of 10 buildings for which plans are made. The contracts let for the others have been mentioned in these columns.

WINNIPEG, MAN.—Local reports state that the city has

made arrangements with the Canadian Pacific whereby the latter is to remove its shops to the north side of the railroad tracks, where they will be enlarged. Other improvements in connection with this work are the enlargement of the yards, a new train-shed, and a new hotel in connection with the proposed station.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

Canadian Society of Civil Engineers.

A paper on "Dam Construction and Failures During the Last Thirty Years," by C. P. Baillairge, was read Feb. 12.

Railway Club of Pittsburg.

The February meeting of the Pittsburg Railway Club will be held Feb. 27. J. B. Greer, of the Pittsburg Filter Mfg. Co., will read a paper on "The Purification of Water for Locomotives."

American Society of Civil Engineers.

At the meeting on Wednesday, Feb. 18, a paper by George S. Morison, Past President Am. Soc. C. E., entitled "The Panama Canal," was presented for discussion. This paper was printed in the January number of "Proceedings."

Railroad Department, Y. M. C. A.

The 11th International Conference of the Railroad Departments of Young Men's Christian Associations will be held in Topeka, Kan., April 30 to May 3. Mr. John J. McCook is Chairman of the Railroad Committee, and Mr. Clarence J. Hicks, 3 West 29th street, New York, is Secretary.

Richmond Railroad Club.

A meeting of the Richmond Railroad Club was held in the rooms of the Y. M. C. A., Main St. Station, Thursday, Feb. 12, at which time there was presented a paper for discussion, by Mr. J. T. Burton-Alexander, on "Modern Systems of Compounding," and a paper on "System for Records and Files and Handling of Same," was read by Mr. F. E. Anderson.

The American Railway Engineering and Maintenance of Way Association.

The fourth annual convention of the American Railway Engineering and Maintenance of Way Association will be held at the Auditorium Hotel, Chicago, Ill., on March 17 and 18. The business includes the annual election of officers, reports of officers, and the consideration of the reports of the 15 standing committees. The election will be on the 18th and the officers to be chosen for the year 1903 are: President, Hunter McDonald, Nashville, Chattanooga & St. Louis Railway; First Vice-President, H. G. Kelley, Minneapolis & St. Louis Railway; Treasurer, W. S. Dawley, Chicago & Eastern Illinois R. R.; Secretary, L. C. Fritch; two Directors (three years), A. W. Sullivan, Illinois Central R. R.; James Dun, A., T. & S. F. Ry. System.

The Engineers' Club of Philadelphia.

On Saturday, Feb. 21, at 8 p. m., John W. Hill will read a paper on the "Improvement, Extension and Filtration of the Water Supply of Philadelphia," illustrated by lantern slides showing the progress and methods of the work.

At the conversational meeting, held Feb. 7, Mr. Henry Wiederhold, visitor, read a paper on "Asphalt and Asphalt Mastics." After touching on the use of asphalt as a cement in ancient times and mentioning the various deposits of the crude material, he explained the manufacture and use of asphalt mastic. He exhibited samples of native asphalt rock and some models showing the application of the mastic on inclined and vertical surfaces, and specimens of floors constructed on an iron frame work. In the discussion which followed, mention was made of numerous works in which asphalt mastic had been successfully used, and the method of using it in lining the new city reservoirs was explained by the Director of Public Works, Mr. Haddock.

On Saturday morning, Feb. 14, the Club inspected the asphalt works of the Vulcanite Paving Company at Long Island City, and saw asphalt and asphalt mastics in the various stages of manufacture, from the crude material to the finished product. The method of manufacture was explained by Mr. Wiederhold and Mr. Clifford Richardson. The Club was entertained at luncheon by Mr. Wiederhold, at the Manhattan Hotel, and covers were laid for 250 members and guests. After luncheon the party was taken through the subway by Mr. Parsons and some of his assistant engineers. The completed portions of the subway were visited, as well as the work in progress in open cut, and the difficulties of the work were pointed out and the methods of overcoming them explained. At the meeting, held the evening of the same day, there were 59 members and visitors present. The election of Mr. W. B. Riegner to the Board of Directors for the unexpired term of Mr. Charles Hewitt, resigned, was announced.

The paper of the evening, on "Apparatus for and Methods of Treating Wood to Protect It from Fire and Preserve It from Decay," was read by Mr. Joseph L. Ferrell, visitor. After pointing out the defects in the old methods of saturating wood with chemicals, Mr. Ferrell explained a new, shorter and more efficient method of treatment. The speaker dealt not so much with the materials used as with the method of applying them. A number of samples of treated and untreated woods were exposed to flame during the reading of the paper, and the results obtained were afterwards exhibited by Mr. Ferrell. In addition to these specimens there were several that had been coated with a new non-combustible varnish or enamel. After a prolonged discussion by many of the members, which brought out the cheapness of applying preservatives by the new method, the meeting adjourned.

PERSONAL.

—Mr. W. J. Taylor, of the Taylor Iron & Steel Company, died at his home at Bound Brook, N. J., Feb. 17, of pneumonia after an illness of three days.

—Mr. H. D. Norris has resigned as Purchasing Agent of the Pere Marquette Railroad to become Vice-President and General Manager of the United States Standard Brick Company, at Detroit, and Secretary of the Saginaw Sandstone Brick Company.

—Mr. John Porteous, at one time General Manager of the National Despatch Fast Freight Line, died at his home in Boston, Mass., Feb. 9. Mr. Porteous was born in Scotland and came to this country when about 19 years old and was for four years with the Great Western. He then went to the Detroit, Grand Haven & Milwaukee, later becoming terminal agent of the Grand Trunk. He was for several years connected with the Central Vermont.

—The new Division Engineer of the Michigan Central at Bay City, Mr. J. F. Pratt, was born in Rutland, Vt., in 1873. He was graduated from the University of Vermont in the class of 1895, and at once took a government position at Ogdensburg, N. Y. In 1896 he was appointed Assistant Engineer of the Mackinaw Division of the Michigan Central and remained in this position, until the first of last month, when he was promoted to be Division Engineer in charge of the Saginaw & Mackinaw Divisions at Bay City.

—General Charles Neilson, who has just become Vice-President and General Manager of the Queen Anne's Railroad, is well-known to the readers of the *Railroad Gazette*. His early railroad service was on the Northern Pacific. He was at one time Fuel Agent of the Erie Railroad, and then for several years was General Superintendent of the Cincinnati, Hamilton & Dayton, from which position he resigned to become General Superintendent of the Railway Mail Service. He was in the post office department a number of years and rose to be Second Assistant Postmaster General.

—Mr. Albert H. Hogeland, who has just been promoted to succeed Mr. Stevens as Chief Engineer of the Great Northern Railway, was born at Southampton, Pa., in 1858, and is a graduate of Lafayette College (Civil Engineer) class of '77. Two years after graduation he began his railroad service on the St. Paul & Pacific as rodman. For four years he was with the Northern Pacific, but resigned in March, 1884, to become Assistant Engineer of the St. Paul, Minneapolis & Manitoba, and has since been in the service of that road and its successor, the Great Northern, as Assistant Engineer, Engineer of Maintenance of Way, Resident Engineer and Assistant Chief Engineer.

—Mr. Arthur M. Kinsman, Engineer of Construction of the Baltimore & Ohio, whose jurisdiction was recently extended over all B. & O. Lines, is 47 years old. He was educated at Worcester, Mass., and entered railroad service in 1876. For a year he was a rodman on the Bedford & Billerica, and then went to the Illinois Central, but resigned in 1880 to take a position on the Chicago, Milwaukee & St. Paul, where he remained one year. He then returned to the Illinois Central and was with this company until May, 1895, when he resigned to go to the Wisconsin & Michigan as Chief Engineer. In March, 1899, he assumed the duties of Engineer of Construction of the Baltimore & Ohio, which position he has held ever since.

—Mr. W. Augustus, who was recently appointed Master Mechanic of the Chicago, Burlington & Kansas City at Centerville, Iowa, has for the last eight years held a similar position on the Keokuk & Western, another Burlington road. He was born March 7, 1849, at Lancaster, Ohio. He entered railroad service in 1867 as machinist apprentice on the Chicago & Alton. For nine years he held minor positions on the St. Louis & San Francisco, and then for a time he was General Foreman of shops on the St. Louis, Keokuk & Northwestern. From 1885 to 1895 he was Master Mechanic and Master Car Builder for the Keokuk & Western, and in December, 1895, he became Superintendent of Machinery, which position, as before stated, he has held until now.

—Mr. R. J. Gross, of Dunkirk, N. Y., Second Vice-President of the American Locomotive Co., has started on a trip around the world. He goes by way of San Francisco and his first stop will be at Honolulu. From there he goes to Japan, Korea and Siam. From China he will travel over the Trans-Siberian Railroad to Russia. Mr. Gross will be absent from this country about a year. He plans to visit every country in Europe. The purpose of his trip is to make a careful investigation of the opportunities for American locomotives in the Orient and European countries and to establish systematic business relations. Mr. Gross will be accompanied on his trip by Charles M. Muchnic, until recently Mechanical Engineer of the Denver & Rio Grande. He will act as Mr. Gross' secretary.

—Mr. J. W. Miller, whose title has just been changed from General Superintendent of the Marine District to General Manager same district, of the New York, New Haven & Hartford, was born in Morristown, N. J., in 1847. He graduated from the Naval Academy in 1867, and served until 1872 as a junior officer. In the latter year he was appointed to special service in connection with the Nicaragua Inter-oceanic Canal survey, but returned the following year to Nicaragua as Secretary of the Commission appointed by the United States Government to determine the best route for a ship canal across the Isthmus. He was afterwards engaged in writing a report on the Nicaragua Canal. After completing three years of sea service in European waters, Mr. Miller was assigned to duty at the Naval Academy, where he remained until 1881, when he was again ordered to sea. He later went to Kansas, where he was made Vice-President and General Manager of the St. Louis, Fort Scott & Wichita Railroad. In 1886 he came east and took the position of General Manager of the Providence & Stonington Steamship Company, later becoming its President. Mr. Miller entered the navy as Lieutenant Commander during the Spanish war. He is a member of the Century Association, and of the University Club, on the council of which he served for many years. He also belongs to several other important societies and clubs.

ELECTIONS AND APPOINTMENTS.

Atlanta, Knoxville & Northern.—J. H. McWilliams has been appointed General Freight and Passenger Agent, with headquarters at Knoxville, Tenn. The position of Traffic Manager has been abolished.

Atlanta Terminal.—The officers of this company, which is to build the new station at Atlanta, Ga., are: President, J. W. English; Secretary, J. S. B. Thompson, and Auditor, W. D. Beymer.

Baltimore & Ohio.—The jurisdiction of Superintendent of Motive Power E. T. White will extend over the following divisions: Philadelphia, Baltimore, Cumberland, Monongah, Shenandoah, Wheeling and Ohio River, with headquarters at Baltimore. The jurisdiction of Superintendent of Motive Power A. Kearney will extend over the Connellsville, Pittsburg and New Castle Divisions, with headquarters at Pittsburg. J. E. Muhlfeld, heretofore Assistant to General Superintendent of Motive Power, has been appointed Superintendent of Motive Power, with jurisdiction over the Newark, Chicago and Cleveland Divisions, including Zanesville car shops, with headquarters at Newark, Ohio. G. A. Schmoll, Master Mechanic, and General Foreman J. J. Tatum, will report to the General Superintendent of Motive Power.

Canadian Pacific.—Max Toltz, heretofore Mechanical Engineer of the Great Northern, has been appointed Consulting Engineer to assist E. A. Williams, Superintendent of Rolling Stock, especially on the new shops which are being built at Montreal.

H. W. Brodie has been appointed Assistant General Passenger Agent of the Western Division, with headquarters at Winnipeg, Man.

Chicago & North Western.—C. T. Dike, heretofore Division Engineer at Boone, Iowa, has been transferred to be Division Engineer, with headquarters at Chicago, Ill. B. J. Sweatt, heretofore Division Engineer at Mason City, has been transferred to a similar position at Boone, and G. Loughnane has been appointed Division Engineer at Mason City, succeeding Mr. Sweatt.

J. A. Peabody, whose position heretofore has been chiefly of an advisory nature, has been appointed Signal Engineer in charge of the signal department. His office is at Chicago. He will report to the General Superintendent in matters of maintenance and operation and to the Chief Engineer in matters of construction. Supervisors will report to the Signal Engineer, but will also report to the Division Superintendent as directed by the General Superintendent. All accounts, pay-rolls, etc., of the signal department are to be kept in the office of the Signal Engineer. The Supervisors of Signals are: W. R. Young, Chicago District; H. J. Hovey, Northern District; H. S. Towle, Southern District, and Charles Geary, Western District. The offices of the first three are in Chicago, and that of Mr. Geary is at Boone, Iowa.

Chicago, Rock Island & Pacific.—A. L. Studer, heretofore Master Mechanic at Cedar Rapids, Iowa, has been appointed Assistant Superintendent of Motive Power, with headquarters at Chicago.

Cornwall & Lebanon.—E. C. Felton has been elected Vice-President, with headquarters at Philadelphia, Pa.

Dayton & Union.—G. H. Ingalls has been appointed General Freight Agent, with headquarters at Cincinnati, Ohio, succeeding E. F. Cost.

Evansville & Terre Haute.—W. K. Allen, Auditor, has been appointed Purchasing Agent, succeeding A. L. Sanger, resigned. (See Pere Marquette.)

Great Northern.—A. H. Hogeland, heretofore Assistant Chief Engineer, has been appointed Chief Engineer, succeeding J. F. Stevens, General Manager and Chief Engineer, resigned. R. C. Morgan has been appointed Assistant Division Superintendent, with headquarters at Everett, Wash., succeeding M. K. Jones, resigned.

R. D. Hawkins has been appointed Mechanical Engineer, with headquarters at St. Paul, Minn., succeeding Max Toltz, resigned. (See Canadian Pacific.)

Illinois Central.—On Feb. 3 the office of Assistant General Superintendent of Northern and Western Lines was created and H. McCourt was appointed to the position, with jurisdiction over all divisions north of the Ohio River. He will report to the General Superintendent of Transportation on matters pertaining to the transportation department; to the Superintendent of Machinery on matters pertaining to the machinery department, and to the Chief Engineer on matters connected with the maintenance of way. On general subjects connected with the railroads under his jurisdiction he will report to the General Manager. Superintendents will report to Mr. McCourt, whose office will be at Chicago. A. H. Egan has been appointed Superintendent of the Chicago Division, with headquarters at Chicago, succeeding Mr. McCourt, and Mr. Egan in turn is succeeded by H. Battisfore as Superintendent of Freight Terminals at Chicago.

H. R. Newman has been appointed Supervisor of Bridges and Buildings, with headquarters at Carbondale, Ill., succeeding G. O. Lilly, resigned, to take a similar position on the Illinois Southern.

Illinois Southern.—M. W. Wells has been appointed General Manager, with headquarters at Chicago.
See Illinois Central.

Indiana Car Service Association.—L. H. Mummert, of South Bend, has been elected Manager, succeeding D. T. Bacon, resigned.

Interoceanic of Mexico.—F. G. Williamson has been appointed Assistant General Manager, with headquarters at Mexico, and Mr. Williamson's former position, that of Assistant to the General Manager, has been abolished. J. H. Feehan has been appointed Acting Superintendent of Transportation, succeeding S. G. Ramsey, resigned. E. M. Wise has been appointed Assistant Terminal Superintendent.

Lehigh Valley.—M. B. Cutter, heretofore Superintendent of Transportation, has been appointed General Superintendent, with headquarters at So. Bethlehem, Pa. He will be in charge of Maintenance of Way, Maintenance of Equipment, Conducting Transportation and Lake, Marine and Canal Lines. The position formerly held by Mr. Cutter has been abolished.

C. P. Coleman having resigned the position of Purchasing Agent has been abolished, and the duties of that office will be performed by the Second Vice-President, effective March 1.

National of Mexico.—R. M. Leech, heretofore Trainmaster, has been appointed Acting Superintendent, with headquarters at Mexico City, Mexico, succeeding A. Clark, transferred.

National of Tehuantepec.—P. Rios has been appointed Superintendent of Motive Power and E. W. Bowans becomes Superintendent of Transportation.

New York Central & Hudson River.—Arthur J. Slade has been appointed Mechanical Engineer, with headquarters at New York, succeeding Edwin B. Katte, who has become Electrical Engineer. V. Spangberg has been appointed Designing Engineer, succeeding C. R. Wadsworth, transferred. J. D. Keiley was appointed Assistant Electrical Engineer, and E. L. Broome becomes Assistant Steam Engineer.

New York State R. R. Commission.—George W. Dunn has been elected Chairman, succeeding Ashley W. Cole, retired from the Commission.

Pere Marquette.—A. L. Sanger, heretofore Purchasing Agent of the Evansville & Terre Haute, has been appointed Purchasing Agent of the P. M., with headquarters at Detroit, Mich.

Philadelphia, Baltimore & Washington.—The headquarters of E. F. Brooks, General Superintendent, have been removed from Philadelphia, Pa., to Wilmington, Del.

Queen Anne's.—Charles Neilson, of Relay, has been elected Vice-President and General Manager.

St. Louis, Memphis & Southeastern.—The headquarters of Chief Engineer C. A. Gavin have been removed from St. Louis, Mo., to Cape Girardeau, effective Feb. 16.

St. Louis Merchants' Bridge Terminal.—J. H. Overall has been elected President. E. F. Kearney has been appointed Superintendent in charge of transportation of this company and the Terminal R. R. Association of St. Louis, with headquarters at St. Louis, Mo., effective Feb. 15.

Southern.—B. C. Milner has been appointed Superintendent of the Louisville Division, St. Louis-Louisville Lines, with headquarters at Louisville, Ky., succeeding W. K. Morley, resigned. C. C. Coffee has been appointed Engineer of Maintenance of Way, at St. Louis, succeeding Mr. Milner.

Terminal R. R. Association of St. Louis.—See St. Louis Merchants' Bridge Terminal.

Texas & Pacific.—J. H. Hyde has been elected a Director, succeeding I. J. Wistar, resigned.

Tifton, Thomasville & Gulf.—J. T. Fleming has been elected Secretary, and H. A. Rushing, Treasurer, with headquarters at Moultrie, Mo., succeeding W. M. Otis, Secretary and Treasurer.

Unadilla Valley.—A. S. White has been elected Vice-President, succeeding R. Brandreth.

Union Elevated (Chicago).—F. J. Guernsey has been appointed Superintendent for the Board of Managers of the lessees of this company, succeeding E. W. Richey, resigned.

Western Maryland.—Winslow S. Pierce, heretofore President, has been elected chairman of the board of this company and the West Virginia Central & Pittsburgh.

West Virginia Central & Pittsburgh.—See Western Maryland.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Baker City Rapid Transit (Oregon).—This company has been organized in Oregon to build a system of street car lines, connecting with all the mines surrounding Baker City, and a line for freight only to a point on the Snake River, 84 miles east of Baker City. Work will begin shortly. Letson Balliet is President, and C. L. Palmer, Vice-President, both of Baker City, Ore.

Bennettsville & Cheraw.—An officer writes that grading is now in progress by the company's forces on this new line in South Carolina, from Bennettsville northwest to a connection with the Seaboard Air Line at Kollock, 10 miles. The work is light, with practically no grades, and one trestle 1,040 ft. long. J. A. Drake is President, and J. N. Drake, Bennettsville, S. C., in charge of building.

Binghamton & Southern.—Charter has been granted this company in the State of Pennsylvania to build from Binghamton, N. Y., southwest to a point at or near Williamsport, Pa., a distance of about 100 miles. The capital stock is $1,000,000. A. B. Walter, Wilkesbarre, Pa., is President. The first board of directors are Joseph D. Stone, R. H. Walker, B. Armstrong and others, all of Wilkesbarre.

Blackstone & Chase City.—Surveys have been completed for this line, which is to run from Blackstone southwest to Chase City, Va., via Lunenburg, about 50 miles. Work will probably be begun early in the spring. T. M. McKennon, Chase City, Va., is interested.

Caldwell, Boise & Butte.—Press reports state that this road has acquired rights of way to build from Caldwell east to Boise, Idaho, 30 miles. Howard Selree, of Boise City, Idaho, is said to be interested.

Canisteo & Jasper (Electric).—This company has recently acquired a franchise to build from Canisteo south to Jasper, N. Y., 10 miles. Lester D. Whiting, Canisteo, is President. L. D. Hewitt, of Buffalo; Thomas Shannon, of Bath, and others are interested.

Cape Girardeau & Chester.—Surveys are reported completed on this line from the river opposite Cape Girardeau, Mo., northwest to Chester, Ill., 60 miles. Work is to be begun very shortly. W. H. Bohnsack, Cape Girardeau, Mo., is President. (June 20, 1902, p. 485.)

Central Alberta.—Application will be made at the next session of the Dominion Parliament for the incorporation of a company to build from Calgary southeast to Lethbridge, in the District of Alberta, a distance of about 100 miles. Frederick Villeneuve, of Montreal, is interested. This projected line parallels the route for which the Calgary & Edmondton already has a charter.

Central Ontario.—An officer writes that work will begin in the spring on the extension from Bancroft, Ont., north to Whitney, 40 miles. A subsidy of $128,000 has been granted by the Ontario government, and 40 miles have been approved by the Dominion Parliament. John D. Evans, Trenton, Ont., is Chief Engineer.

Chicago, Rock Island & Pacific.—Track laying is reported begun on the Paul's Valley extension from Chickasha south to Lindsay, Ind. T., 40 miles. The extension is owned equally by the Atchison, Topeka & Santa Fe and the Chicago, Rock Island & Pacific, and both companies will run trains over the line when it is completed.

Cleveland Manufacturers' Belt Line & Terminal.—This company has been incorporated in Ohio, to build from Lorain east to Willoughby, with branches from Berea south to Hinckley, 12 miles, via North Royalton, and from Cleveland south to Medina, 20 miles. A. E. Brouse, of Zanesville, Ohio, is interested.

Cumberland-Narrows Park Electric.—Articles of incorporation have been filed by this company to build an electric line between Narrows Park and the Baltimore & Ohio station at Cumberland. R. H. Koch, of Pottsville, Pa., and R. S. Bell, of Cumberland, are interested.

Deland & Daytona Electric.—An officer writes that this road will be built from St. Johns River, south via Deland to Daytona, Fla., about 30 miles. Bids are now being asked for the grading and work will probably be started within the next 60 days. Frank S. Bond, care of Bond & Bond Co., Deland, Fla., may be addressed.

Egerton Tramway.—Surveys are reported completed for an electric line from Stellarton north via New Glasgow to Abercrombie Point, Nova Scotia, about 10 miles. N. H. Flaherty, Boston, Mass., is said to be interested.

Erie.—See Railroad News.

Fairhaven & Westville (Electric).—Work is again in progress on the unfinished extension of this road from New Haven to Derby. The Connecticut Railway & Lighting Co. has the contract. The West Shore Division between Savin Rock and Woodmont, eight miles, is being double-tracked. (Feb. 14, 1902, p. 121.)

Florida East Coast.—Grading is reported begun from Miami, Fla., in a southwesterly direction through Grove and Cutler, a distance of 22 miles. Surveys were reported in that vicinity, and also in the Everglades last October. (Oct. 10, 1902, p. 785.)

Gulf, Beaumont & Kansas City.—The extension of this line from San Augustine north to Center, Texas, 19½ miles, has been graded and five miles of track have been laid. L. J. Smith, Kansas City, Mo., is the contractor. (Official).

Kansas, Oklahoma & Southwestern.—An amended charter has been passed by this company, with capital stock of $11,000,000. The proposed route will be from Peru Junction, Kan., southwest to Kirkland, Texas, via Stillwater, Guthrie and El Reno in Oklahoma. Branch lines are projected southeast from Stillwater through Indian Territory, to Fort Smith, Ark., and from Stillwater northwest through Oklahoma to Woodward. It is reported that the line has been surveyed between Peru and Guthrie.

Klondike Mines Ry.—Press reports state that work on this road will be begun very shortly. The proposed route is from Dawson southeast up Bonanaza Creek, to a point on the Stewart River, 84 miles from Dawson. Rights of way have already been secured. E. C. Hawkins, Dawson City, Alaska, is the chief promoter.

Latrobe, Pleasant Unity & Greensburg Street.—An officer writes that the proposed route of this new electric road is from Latrobe south to Pleasant Unity, and thence northwest to Greensburg, Pa., 17 miles. Rights of way are now being secured. The work will be light and no tunnels will be necessary. J. L. Freeble, Latrobe, Pa., is interested. (Feb. 6, p. 108.)

Mason City & Fort Dodge (Chicago Great Western).—An officer writes that this line, which is building from Fort Dodge southwest via Carroll, Manning, Harlan and Minder to Council Bluffs, 132 miles, has been entirely graded. Track has been laid from Fort Dodge to a point four miles west of Manning, 69 miles. The viaduct across the Des Moines River at Fort Dodge is practically completed. (Jan. 2, p. 18.)

Midland Pacific.—Press reports state that the contract for building the first 10 miles of this line has been let. The proposed route is from San Luis Obispo, Cal., east through Santa Barbara and Kern to Bakersfield, 100 miles. C. H. D. Fox, Santa Maria, Cal., is interested. (Jan. 30, p. 92.)

Minneapolis & St. Louis.—An officer writes that the relocation of the line of this road from Hopkins southwest to Chaska, Minn., 14½ miles, has been completed as far as Eden Prairie, 6½ miles. The Lorimer, Gallagher & Walsh Construction Co., Chicago, Ill., is the contractor.

Missouri Central.—This company has been incorporated in Missouri to build an electric line from Brookfield, in Linn County, to Glasgow, in Howard County, and eventually to St. Louis, a total of 194 miles. The permanent survey has been made, and in order to complete the road in time for the St. Louis fair it is proposed to begin work simultaneously in each of the seven counties through which the road runs. George B. Harrison, of Glasgow, President; General E. W. Price, of Keytesville; W. W. Garth, of Columbia, and others are interested.

Nashville, Chattanooga & St. Louis.—Contract for grading the new yards at Colesville, Tenn., has been let to the Southern Contracting Co., of Ludlow, Ky. The object of building the new yards is to relieve the congestion of traffic at Dickson, two miles away. Work will be begun within 30 days. Hunter McDonald, Nashville, Tenn., is Chief Engineer.

New Mexico Northern.—The contract for building this road from Bland to a point near Thornton, N. Mex., 20 miles, on the Atchison, Topeka & Santa Fé, has been let to M. A. Wogan, Dallas, Texas. Work will be begun shortly. D. C. Dunlap, Albuquerque, N. Mex., is Chief Engineer. (Dec. 19, p. 972.)

North Shore.—Contract has been awarded to Martin & Hinkle, San Francisco, for a tunnel through White Hill, 18 miles north of San Francisco. The tunnel will be 3,110 ft. long, and will shorten the line between San Francisco and Cazadero, Cal. (June 13, 1902, p. 454.)

Pennsylvania.—Contract has been let to the Columbia Contracting Co. of Pittsburg, for grading the Brilliant branch, 2½ miles long, which will be built from the main line at Fifth avenue, Pittsburg, to Brilliant Station, and thence across the river to Aspinwall. The contract for the foundation and piers of the bridge across the Allegheny River at Brilliant was awarded to Drake & Stratton, New York city. Work will begin immediately.

William E. Howley, Pittsburg, Pa., has received the contract for building a branch line 20 miles long from East Brady, Pa., to coal fields in Clarion County. Work is to begin at once.

Philippine Railroads.—A franchise has been granted the Manila Ry. Co. to build from Guiguinto, 40 miles north to Calantuan. The only road in operation at the present time in the Philippines is the line from Manila north to Dagupan. (Nov. 28, p. 918.)

Sacramento & Oakland.—Articles of incorporation were filed by this company on Feb. 5. The proposed route is from Oakland northeast via Alameda, Solano, Yolo and Sacramento Counties to a point near Sacramento. A branch of 25 miles westerly to Point Richmond, is projected, and also one of 10 miles to Martinez. A. J. Brown, President, and A. D. Wilson, Chief Engineer, both of Oakland, Cal.

Sandusky, Huron, Vermillion, Lorain & Loudonville.—This company has been incorporated in Ohio, to build from Sandusky southeast to Loudonville, 60 miles, passing through Erie, Huron, Richland and Ashland Counties. A. E. Boone, F. J. Terry, Silas A. Baldwin and J. H. Coke, of Columbus, Ohio, are incorporators.

Seaboard Air Line.—Press reports state that this company has completed all the arrangements to enter the city of Birmingham, Ala. For some time past it has been securing rights of way between Birmingham and Irondale, seven miles, but it is stated that these are now secured and that contracts for work between these two points will be let in a few days.

Southern.—The contract for building the first 30 miles of second main track, on the line from Alexandria southwest to Orange, Va., 80 miles, has been let, and work is in progress.

Southern Missouri.—This line from Little Rock Landing, Mo., via St. Genevieve west to Bismarck, 43 miles, has been entirely graded, and track has been laid as far as the Flat River, 32 miles. McArthur Bros., Chicago, are the contractors. Robert Moore, St. Louis, is Chief Engineer. (Aug. 29, 1902, p. 682.)

Toledo Central Station Ry.—This company has been incorporated in Ohio, in the interest of the Wabash, to build a line 4½ miles long at Toledo, connecting the tracks of the Wheeling & Lake Erie and the Ann Arbor with the Wabash. It will also build a large union passenger station. A. L. Smith, Toledo, Ohio, is President.

Victoria, Vancouver & Eastern.—Right of way has been secured for the proposed extension of this road from Grand Forks, B. C., in a westerly direction, five miles, to Phœnix, near the Granby smelter. (Nov. 7, 1902, p. 864.)

Wheeling, West Liberty & Belt.—This company has been incorporated by C. L. Hill, of Wheeling; Wm. Chambers, of Elm Grove, and others, to build an electric line from Wheeling north to Fulton and West Liberty, W. Va., 13 miles; it is proposed also to build a branch from a point between Edgington Lane and Fulton south to Mount De Chantel and thence to Thompsons, on the main line.

Youngstown & Southern (Electric).—This company has increased its capital from $100,000 to $1,800,000, for the purpose of building an electric line from Youngstown south through Lisbon, Ohio, to East Liverpool, 35 miles.

GENERAL RAILROAD NEWS.

Chesapeake Beach.—D. H. Moffatt, of Denver, Colo., has obtained a judgment of condemnation in the Circuit Court, for Calvert County, Maryland, against the Chesapeake Beach, for $56,979. The First National Bank of Denver has also obtained a judgment against the same company for $31,166. Neither claim was contested. The road runs between Hyattsville and Chesapeake Beach, 34 miles.

Chicago & North Western.—At a recent meeting of the stockholders, it was voted to increase the capital stock of this company from $61,509,798 to $100,000,000. The directors were authorized to issue common stock from time to time, in amounts not exceeding $10,000,000. It was also voted to buy the franchises and property of the Fremont, Elkhorn & Missouri Valley. (Nov. 21, 1902, p. 902.)

Chicago Great Western.—See Chicago, Rock Island & Pacific below.

Chicago, Rock Island & Pacific.—The joint purchase by this company and the Chicago Great Western of 160 acres of land in Sioux City, is reported. This is generally believed to indicate the eventual extension of one or both of these lines to Sioux City.

Erie.—The directors have recently authorized an issue of $10,000,000 4 per cent. 50 year gold bonds, convertible into common stock at the rate of $100 in bonds for $200 in stock, after April 1, 1905, and before April 15, 1915. The bonds are to be offered for subscription pro rata to the holders of the first and second preferred and common stock of the company at 87½ and interest. An underwriting syndicate is to take all bonds not subscribed for by the trust certificate holders. The proceeds of the new bonds will be used for extensive improvements, of which the more important are: A modern terminal station and ferry-house at Jersey City; new line over Bergen Hill, to relieve the tunnel of some of the passenger traffic; new ferry boats, already ordered; various improvements in grades, second track; new ferry-houses at Chambers and 23rd streets, New York, and the purchase of 3,000 freights, 50 passenger cars, and 100 locomotives.

The gross earnings of this road for the last six months of 1902 were $20,091,110, as against $19,510,819 during the same months in 1901, an increase of $580,291. The net earnings during the latter half of 1902 were $7,041,386, showing an increase of $316,346 over the last six months of 1901.

Fremont, Elkhorn & Missouri Valley.—See Chicago & North Western.

Lake Shore & Michigan Southern.—Announcement has been made by this company, that in future all trains of the Detroit, Toledo & Milwaukee entering Toledo, will enter the city over the Lake Shore tracks from Tecumseh. At present the trains of the D., T. & M. run to and from Toledo over the Ann Arbor track, the junction being at Dundee.

New Orleans & Northeastern.—This road, which runs from Meridian, Miss., to New Orleans, La., 198 miles, has been acquired by the Southern. It is the New Orleans end of the Queen & Crescent which is controlled by the Southern, but it has always been operated under an entirely separate management.

New Orleans & San Francisco (St. Louis & San Francisco).—Right of way into New Orleans has been granted to this road by the New Orleans City Council. According to the ordinance which has been passed, this company not only gains an entrance into the city, but it obtains the privilege for a station on Canal street, and the right to build and operate a railroad along the river front. It has already purchased a large amount of land, as well as the Carondelet Canal.

St. Louis & San Francisco.—It is reported that B. F. Yoakum, President of this company, and several of the directors, have purchased an interest in the Kirby Lumber Co., of Texas, thus insuring to the St. Louis & San Francisco the business of carrying a good portion of the output from the mills of the lumber company.

Southern.—See New Orleans & Northeastern.

Terminal Railroad Association of St. Louis.—J. P. Morgan & Co., and Redmond, Kerr & Co., are offering $18,000,000 general mortgage refunding 4 per cent. 50 year gold bonds of this company at 101. This is a part of the authorized issue of $50,000,000, of which $17,500,000 is reserved to retire outstanding bonds; and $14,500,000 is reserved for issue after Jan. 1, 1906. The proceeds from the sale of these bonds will be used for extensive improvements in St. Louis proper, and for purchasing several small lines in and about St. Louis.